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COVER: Fresco, Villa Arianna, Stabiae 1st century A.D.
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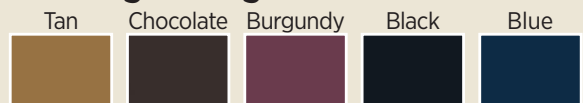
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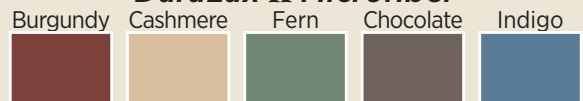
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BY SARA TOTH STUB

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HANDS TO WORK

As a harbinger of spring, the magazine's editors have prepared "The Archaeology of Gardens" (page 32). This special section surveys evidence of the many ways in which people throughout history have chosen to work the soil in their immediate environs. From small, ancient vineyards to medicinal plots, from gardens meant for botanical study to those for royal enjoyment—all add to the story of the long-standing human need to cultivate a relationship with nature.



Fresco, Villa of Poppaea

"Imaging the Past" (page 42), by contributing editor Andrew Curry, begins with the consideration of the earliest stone tools, created some 3.3 million years ago, and the theories about what kinds of creatures made them. Curry next examines the work of researchers using the latest brain scanning techniques on modern subjects to speculate on what defines human behavior. Finally, he asks whether our ability to craft tools is tied to our ability to speak. The answers to these questions are both intriguing and surprising.

Early human activity in the Caribbean is the subject of "Entombed in Asphalt" (page 46), by Megan Gannon. Pitch Lake in Trinidad—one of the largest tar pits in the world—is known to have had mythical importance to the island's early Arawak residents. Archaeologists are now analyzing evidence

there, dating to the fourth millennium B.C., of the region's aboriginal cultural identity long before colonial occupation.

Oftentimes, the relationship between people and the environment is a fraught one. Such was the case for a little-known culture called the Casma, inhabitants of Peru's Casma Valley. "How to Survive Climate Change" (page 26), by Lizzie Wade, outlines evidence of extraordinary adaptation to severe weather caused by El Niños. The Casma's predecessors, the Moche, attempted to control both nature and the populace through violent ritual. In contrast, between 700 and 1400, the Casma provided economic stability through trade and practices that forged community cohesion.

Viking raiders are widely known to have targeted the English coastline in hit-and-run raids since at least 793, when they attacked the monastery at Lindisfarne. But now archaeologists are realizing that by the late ninth century, Vikings arrived by the thousands with designs on the land itself. "The Viking Great Army" (page 50), by senior editor Daniel Weiss, explores evidence at several sites that shows that Vikings settled in England and ultimately became a vital part of the country's fabric in ways that can still be seen today.

And do not miss "Letter from Hungary: The Search for the Sultan's Tomb" (page 57), by Sara Toth Stub, who reports on efforts to discover the resting place of the Ottoman sultan Suleiman the Magnificent.

Claudia Valentino

Claudia Valentino
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FROM THE PRESIDENT

DISCOVERY AT ITS OWN PACE

Recently, my hairdresser described the excitement of the six-year-old son of a friend who received a toy set of dinosaur bones embedded in dirt and equipped with small digging tools. This story encapsulates the universal attraction of archaeology: Everyone enjoys the thrill of discovery. The tangible bond with the past, created by recovering an artifact made centuries ago, is as close as we can come to time travel. Many people do not realize, though, that digging is a means to an end, rather than an end in itself. Excavation provides the raw data that archaeologists study to learn about the past.



Jodi Magness at Huqoq

My own project at Huqoq in Israel's Galilee illustrates this. Our excavations are bringing to light a fifth-century synagogue paved with mosaics depicting an extraordinary series of biblical scenes including Samson's exploits, Noah's Ark, the parting of the Red Sea, Jonah, and the Tower of Babel. We dig at Huqoq for only one month per year and I am often asked why we do not expose the entire synagogue at once. Aren't we eager

to uncover all the mosaics? The decision to excavate for only one month at a time is a deliberate one. I undertook the Huqoq excavations to answer questions about Jewish settlement in Late Roman Galilee. The mosaics are an unexpected and spectacular discovery, but not one of the project's goals. At Huqoq, for example, the ruins of an Ottoman period Muslim village that overlie the synagogue are excavated and documented with the same care and precision as the mosaics. Our approach exemplifies the fact that archaeologists do not prioritize one category of remains over another.

Archaeology is not an exact science because it involves human behavior (past and present) and derives its data from an experiment that can never be replicated. The process of excavation destroys the evidence since, once removed, the dirt, stones, and artifacts can never be replaced exactly as they were. Therefore, archaeologists excavate slowly and deliberately, and we endeavor to document everything as fully as possible.

Archaeologists' ultimate goal is not excavation but making our findings accessible to others through publication. After one month at Huqoq, my team and I have more than enough data to process for a year. Working in this manner allows us to publish annual reports and refine our understanding of the site in advance of the next season. When the project ends, we will devote ourselves to producing a final report. And, in a similar way, by bringing to readers the most exciting recent discoveries, *ARCHAEOLOGY* helps archaeologists like me communicate with you—the public.

Jodi Magness

President, Archaeological Institute of America

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FROM OUR READERS

REINDEER VS. CARIBOU

In “Where the Ice Age Caribou Ranged” (January/February 2018), Jason Daley points out the fact that the species called reindeer in Europe are usually called caribou in North America. True, taxonomists now classify reindeer and caribou as a single species, but the morphological differences that originally led scientists to identify each as a distinct species are still evident and of note to modern indigenous peoples.

Ron Boggs
Helena, MT

A SPECIAL SPECIES

I was intrigued by reading about the dolphin skeleton found in a grave on the Channel Island of Chapelle Dom Hue (“World Roundup,” January/February 2018). There is a phenomenon known, somewhat unscientifically, as “friendly dolphins,” in which dolphins will seek out the companionship of humans, and in some cases even save human lives. This is well attested in historical stories as well as more modern examples. There are, even today, fishermen who cooperate with wild dolphins (or is it the other way around?)

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to catch fish—the dolphins herd the fish into waiting nets. Was this individual dolphin a friendly dolphin to the religious community, deserving of a special burial?

Perhaps less romantically, while we know dolphins are mammals, since they come from the sea, perhaps they can be consumed during Lent when meat is proscribed from religious diets? Perhaps this dolphin was miraculously stranded just in time to provide some meals to the monks, who buried the animal in thanks to God? I enjoy your magazine very much.

Mark J. Palmer, Associate Director
International Marine Mammal Project
Berkeley, CA

NO ONE LIKES FRUITCAKE

I read with amazement your article “Super Fruitcake” (January/February 2018), which describes finding a completely intact, unopened 106-year-old fruitcake. This article serves as confirmation of my wife’s theory concerning fruitcakes. She posits that the recipient merely regifts the fruitcake to someone else, who does exactly the same thing, and this process continues year after year. Therefore, I conjecture that this 106-year-old fruitcake is not really special. If anyone were to actually unwrap a fruitcake they received as a gift, it is very likely that they would discover that the fruitcake is approximately the same age as that discovered in the article.

Steve Weston
Lompoc, CA

The fruitcake! Was it forgotten? Or deliberately left behind? We’ll never know.

Mary Wackerle
Midland, MI

I was quite amused by your story about the 106-year-old “Super Fruitcake” from Cape Adare, Antarctica, which brought back to mind a personal experience. I spent 20 seasons serving as an LC-130H navigator with the New York Air National Guard in support of the National Science Foundation’s Antarctic Research Program.

About four years ago, the weather went bad quickly while we were out on a remote research camp mission. Low on fuel and with a lack of alternative landing sites, we opted to spend the night at the CTAM/Beardmore Glacier science camp. Life at a remote Antarctic science camp is challenging, and the one thing that brings comfort to the scientists who work and live there through the short austral working season is good, hearty camp food. While we were there, to show their hospitality, the camp’s residents, who seemed to be gobbling up a fruitcake, offered some to my stranded flight crew for dessert. On further discussion, they divulged that the fruitcake was sourced from a nearby abandoned U.S. Navy food cache from around 1967! The cold, dry conditions appeared to have perfectly preserved it in the tin container—but we respectfully declined the offer.

Lt. Col. Kurt Bedore, U.S. Air Force (Ret.)
Burnt Hills, NY



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FROM THE TRENCHES

LATE-BREAKING NEWS AND NOTES FROM THE WORLD OF ARCHAEOLOGY

THE MESOPOTAMIAN MERCHANT FILES

The world's earliest evidence for a robust long-distance trading network comes in the form of thousands of clay tablets excavated from the Bronze Age site of Kanesh, in central Turkey. From about 2000 to 1750 B.C., this bustling city played host to a number of foreign merchants from Ashur, an Assyrian city some 700 miles to the south-east in modern-day Iraq. At the end of the third millennium B.C., Ashur's king lifted the government monopoly on trade, opening the way for private merchants to operate donkey caravans that took luxury fabrics and tin north into the Anatolian heartland, where they exchanged their wares for silver and gold bullion in at least 27 city-states. In private archives at Kanesh, these entrepreneurs stored clay tablets inscribed with their business letters and contracts, as well as shipping and accounting records. A massive fire destroyed the merchants' homes, but also baked and preserved these tablets, leaving a record of intensive trade whose detail wouldn't be matched until the merchant houses of the Italian Renaissance began to document their activities.

Harvard University Assyriologist Gojko Barjamovic is currently collaborating with a group of economists, including the University of Virginia's Kerem A. Cosar, to use mathematical models to analyze data from the tablets to reconstruct this vibrant trading system. Such is the fine-grained nature of these documents that the team has been able to use them to estimate the locations of 11 "lost" cities, ancient centers whose names are mentioned in the tablets but whose geographic position is unknown.

Barjamovic has long studied the Kanesh tablets and used traditional historical techniques to examine trade routes and posit the location of these lost cities. "I've traveled all over central

Turkey to get to know the region," says Barjamovic. "I've even stopped in towns and asked local old-timers where the trade routes were before modern roads were built." Now, he has teamed up with Cosar and two other economists to analyze the tablets using quantitative techniques based on an economic concept known as the structural gravity model. First developed in the 1960s, the model, surprisingly, is based on Newton's law of universal gravitation, which states that the mass and distance between two particles determines the gravitational attraction between them. This law was used in



Assyrian cuneiform tablet from Kanesh

FROM THE TRENCHES

the mid-nineteenth century to predict the existence and location of Neptune based on anomalies observed in the orbit of Uranus. In a new application of the concept, modern-day economists use the structural gravity model to posit trade relationships between economic units based on their size and the distance between them. “It’s a very successful model,” says Cosar. “It can predict trade flows between cities or countries with an 80 percent success rate.”

The team began by isolating 2,806 tablets that mentioned travel itineraries between two or more cities. They then employed equations based on the structural gravity model to predict



Merchants' quarter at Kanesh

trade flow between different centers. “We know where Kanesh and the other known cities are located,” says Cosar. “Depending on how much a lost city interacted with known cities, we could

estimate the distance between those cities, as well as their economic size.” The model predicted locations of the lost cities within a radius of about 20 miles. In many cases, the team’s estimates lined up with proposals made by historians. In other cases, they supported one historian’s proposal over another. Remarkably, the ancient economic sizes of the cities could also be used to predict the income and population of cities now located in the same regions in modern-day Turkey. The key to a city’s long-term success, it seems, lies in its position on natural trade routes, ones first plied by donkey caravans some 4,000 years ago.

—ERIC A. POWELL

OFF THE GRID EL PILAR, BELIZE

El Pilar, an ancient Maya city that straddles the border between modern-day Belize and Guatemala, boasts more than 25 plazas and numerous houses, temples, and grand monumental structures. Archaeologist Anabel Ford, who first recorded the site in 1983, works with local Maya people, in cooperation with both governments, to run El Pilar Archaeological Reserve for Maya Flora and Fauna. Much as it may have been some 2,300 years ago when first settled, the city remains nestled in the forest, one with the natural environment. This distinguishes El Pilar from other, perhaps better-known, Maya sites throughout Mexico and Central America, where trees are often removed and lawns manicured to accommodate tourists.

El Pilar, a major urban center at its height between A.D. 500 and 1000, featured large forest gardens, relying on swidden, or slash-and-burn, agriculture. Ford has worked for decades with the native Maya community to preserve indigenous agricultural and gardening practices. At El Pilar, as a result, visitors can explore the remains of the ancient city by following nature trails leading them through plazas, and can discover Maya ruins as some of the first archaeologists to encounter them did in the nineteenth century. “This is how I would like the site to be viewed,” Ford says, “through the roots and the trees and vines, so you really feel like you’re coming upon it for the first time.”

THE SITE

While the reserve is accessible from Guatemala, most visitors will likely arrive from Belize. El Pilar can be reached from the

village of Bullet Tree Falls, just outside the town of San Ignacio. A Belize Institute of Archaeology sign in Bullet Tree Falls marks an all-weather dirt road that leads to the site.

Local tour companies offer excursions, and visitors can arrive by taxi, rental car, mountain bike, or horse, or they can hike the roughly seven-mile road. Guests are encouraged to explore on their own, but site caretakers and local tour guides are a helpful resource for any interested traveler.



Caretaker, El Pilar

WHILE YOU'RE THERE

Belize’s Cayo District is home to a wealth of Maya historical sites. Begin your journey at El Pilar in the morning when it is coolest and then travel back to San Ignacio to have lunch and visit the near-

by Cahal Pech, believed to have been an acropolis-palace for an elite Maya family during the Classic period, between A.D. 250 and 900.

—MARLEY BROWN

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FROM THE TRENCHES

HE'S NO STONE FACE

A recently rediscovered fragment of an abbot's grave slab from North Wales may offer an unusual glimpse of a medieval personality. University of Chester archaeologist Howard Williams analyzed the two-foot-long stone piece and found that it once lay atop the tomb of an abbot named Howel who led an important Welsh abbey around 1300. Williams notes that the slab depicts Howel in realistic fashion—rare for the period—and wearing a broad smile. “It’s eerie,” says Williams. “The vast majority of these medieval funerary monuments show somber-looking characters who are focused on prayer, not grinning as if for a graduation portrait.” Williams notes that Howel was abbot during the English conquest of Wales in 1283, which left his abbey severely damaged. Records suggest Howel was a power broker during the period and might have been seen as an important source of stability in the community. Williams speculates that the monks who fashioned the slab may have been trying to capture Abbot Howel’s reassuring character. “That smile might have communicated that sense of ‘keep calm and carry on,’” says Williams. In troubled times, perhaps the fond memory of a smiling abbot offered some comfort to the monks he left behind.

—ERIC A. POWELL



Grave slab, North Wales

SATELLITES ON THE SILK ROAD

For thousands of years, Afghanistan has provided a passage for conquerors and commerce alike. It has also very often been a place of conflict. For decades, the U.S. Departments of Defense and State have had spy satellites collecting images over the country, some of which they are now sharing with researchers from the University



of Chicago's Afghan Heritage Mapping Project (AHMP). “The imagery is absolutely phenomenal,” says AHMP’s Kathryn Franklin. “Every single day in the lab someone says, ‘Do you see what I’m seeing?’ There’s something a little bit magic in it.”

Working with their Afghan colleagues, the AHMP’s goal is to record

all of Afghanistan’s cultural features. One of the most recent stunning successes has been the identification of 160 large early modern caravanserais where travelers and traders would stop for the night as they and their camels made their way along the Silk Road carrying gems, spices, sugar, textiles, ceramics, paper, money, and slaves. Apart from their size and frequency, what makes the caravanserais so amazing, explains Franklin, is that the idea has persisted that as soon as people could use boats, they did so exclusively. “But now we have this overwhelming evidence,” she explains, “that these important routes were preserved and maintained by the Persian and Mughal Empires because trade and travel were important not just economically, but to their ideas of how to be a rich and powerful state.”

—JARRETT A. LOBELL

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GODS OF THE GALILEE

While excavating three Byzantine churches in Galilee, archaeologists from Kinneret College on the Sea of Galilee uncovered seven intact mosaic inscriptions that are beginning to fill in the story of small-village life in the fifth century A.D. The inscriptions are in Greek, and by virtue of mistakes in the language, Mordechai Aviam, who directs the project with historian Jacob Ashkenazi, who read the inscriptions, believes that the town and surrounding area was populated during the Roman period by a local Semitic people who were pagans. By the mid-fifth century, they had converted to Christianity. One inscription, one of the longest found to date in western Galilee, gives the names of donors and the names and positions of church officials, including Irenaeus, the bishop of Tyre in 445. “The first importance of these mosaics is that they give us good, dated inscriptions,” Aviam says. They also connect this small, unknown village to the larger Byzantine world.

Another mosaic mentions a woman named Sausann (or Shoshana) as a donor to the church’s construction. This inscription, the first in the region to mention a female donor, “tells us that even in the smallest villages in rural Galilee in the

Christian period, women supported ecclesiastical structures and that there were women who had strong personal, social, and financial positions,” says Aviam.

—JARRETT A. LOBELL



Sausann mosaic, Galilee, Israel



Donor inscription, Galilee, Israel



THE VENUS OF VLAKNO

A 15,000-year-old bone pendant found at Vlakno Cave in Croatia may be a late type of Venus figurine, such as the famous Venus of Willendorf, which dates to more than 24,000 years ago. The Croatian Venus is a more slender and abstract human figure than the zaftig woman of Willendorf. The geometric pattern on the bone is similar to patterns found on other pieces of art from the

Epigravettian period, during which sea levels were approximately 400 feet lower than they are now. What is today the northern Adriatic Sea was a broad plain that supported large herds of game animals hunted by the people at Vlakno. Other than the Venus pendant, however, no art produced by the Epigravettian people has turned up. Some perforated deer teeth and seashells are the only other symbolic artifacts found at the site.

—ZACH ZORICH

Venus figurine

CAESAR'S ENGLISH BEACHHEAD

Almost one hundred years before the Roman Empire conquered Britain, Julius Caesar invaded the island in 55 B.C. and again the following year. The exact locations of his landings have been debated, but recent evidence suggests that one occurred at Ebbsfleet, at the Isle of Thanet in eastern Kent. During construction of a modern road, workers



Ebbsfleet, England

discovered a large ancient ditch measuring around 15 feet wide and six feet deep. Objects found nearby, including Roman weapons, indicated that it was constructed around the middle of the first century B.C., and its size and shape are consistent with Roman defensive networks of that era. Archaeologists believe that Caesar's army built a temporary fort at the site to protect his fleet of 800 ships. "The wider significance of the discoveries at Ebbsfleet is to refocus attention on the aftermath of Caesar's invasions," says University of Leicester archaeologist Andrew Fitzpatrick. "Caesar never intended to stay in Britain," he adds, "but we theorize that the peace treaty he concluded then paved the way for the eventual invasion and permanent occupation of the Romans in A.D. 43."

—JASON URBANUS

Javelin tip



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The bust of the colossal statue of the god Hapy has been strapped with webbings before being cautiously raised out of the water of Aboukir Bay, Egypt; IEASM Excavations; Photo: Christoph Gerigk © Franck Goddio / Hilti Foundation

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FROM THE TRENCHES

HEAD IN THE SAND

A piece of American cinematic history has been uncovered in California's Guadalupe-Nipomo Dunes. Researchers have removed the head of a 13-foot-tall plaster sphinx built for Cecil B. DeMille's 1923 silent film *The Ten Commandments*, one of 21 sphinxes designed by French artist Paul Iribe for a massive Egyptian Exodus set. Since the 1990s, efforts have been under way to find remains of the set, which DeMille deliberately buried to prevent other filmmakers from using it. According to Doug Jenzen, director of the Guadalupe-Nipomo Dunes Center, rapidly shifting sands will soon leave the remaining material vulnerable to disintegration, allowing little time to save evidence of a pivotal moment in U.S. popular culture. "These silent films were successful enough that the production companies were willing to experiment at great expense," he says. "If they had tanked, perhaps we wouldn't have *Gone with the Wind* and *The Wizard of Oz*. If these movies had flopped, we wouldn't have the blockbuster films we have today."

—MARLEY BROWN



Plaster sphinx, California

Sphinx head, after removal for transport



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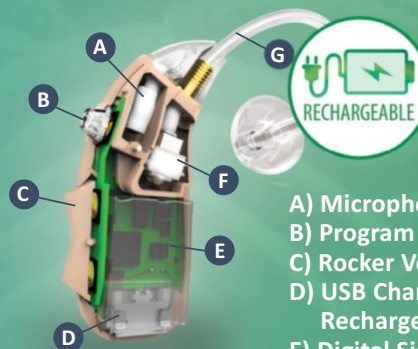
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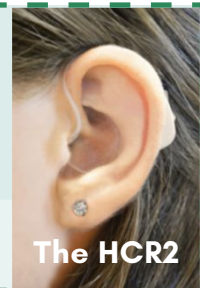
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FROM THE TRENCHES



Clay seals, Doliche, Turkey



SEALS OF APPROVAL

Archaeologists working in the ancient city of Doliche, now Dülük in modern-day Turkey, have uncovered a large collection of 1,800-year-old clay seals called

bullae, which date to the period when the city was part of the Roman province of Syria. Many of the bullae appear to have been used for official government business and show various deities, including depictions of Roman emperors shaking hands with Jupiter Dolichenus, a thunder and war god indigenous to the area, whose cult spread across the Roman Empire in the second and third centuries A.D. “It is one of the great enigmas in the history of Roman religion that the main local god from a second-tier city of the north Syrian hinterland developed into one of the best attended cults of the empire,” says Michael Blömer, codirector of the University of Münster excavations. According to Blömer, “In one seal, the emperor is actually shown worshipping Jupiter Dolichenus. This close bond between a local deity and the emperor is a very peculiar motif and points to a special connection between Doliche and the imperial center.” This connection may partly explain how the god became so popular.

—MARLEY BROWN

Doliche, Turkey

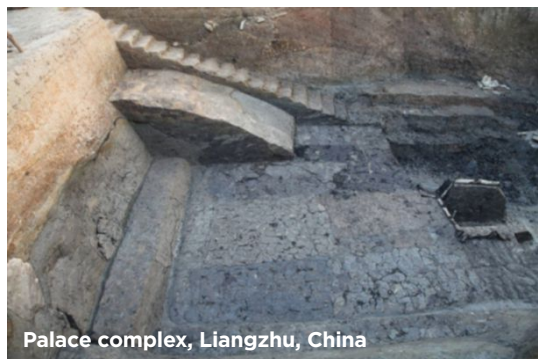


EARLY SIGNS OF EMPIRE

Natural disasters were a constant threat for people living in the ancient city of Liangzhu in China's Yangtze Delta. The annual monsoons posed a severe risk of flooding, so the city's residents constructed an extensive network of dams and reservoirs along with an enormous levee in and around the 740-acre settlement. "The sheer scale is really phenomenal—the scale of landscape transformation, the scale of labor mobilization, and the scale of rice farming as well," says Yijie Zhuang, one of the project's archaeologists, based at University College London. He believes that these constructions were used to irrigate rice paddies and transport stone and timber from the nearby mountains. The hydraulic complex consists of 51 canals in and around the city and 11 dams forming

two reservoirs. All of this was accomplished between 5,000 and 4,800 years ago, during the Neolithic period, about 1,000 years before state-level societies capable of these kinds of massive public works were thought to have developed.

Liangzhu had an estimated 22,900 to 34,000 residents. Excavations there have been ongoing for the past few decades.



Palace complex, Liangzhu, China

Previous excavations have uncovered burials containing luxury items such as exquisitely carved jade artifacts, which indicate that the city was socially stratified. Liangzhu is not the only ancient site that suggests that complex societies were developing earlier than thought. Upstream on the Yangtze River, another ancient city, Shima, may also have had large-scale construction projects around the same time.

—ZACH ZORICH

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FROM THE TRENCHES

TUT'S MESOPOTAMIAN SIDE



Wooden box

Embossed
gold sheet



Gold fragments



Although the treasure of the Egyptian pharaoh Tutankhamun's grave, one of the most famous archaeological discoveries of all time, was found nearly 100 years ago, researchers are still learning new things about ancient Egyptian society by studying the grave assemblage. In 1922, British archaeologist Howard Carter uncovered the lavish 3,300-year-old tomb in the Valley of the Kings. Now, a German-Egyptian project has analyzed hundreds of embossed decorative gold items from the grave for the first time. The fragmented gold pieces were boxed up shortly after they had been discovered and remained in museum storage until recently.

Experts have painstakingly reassembled the ornamental applications, which would have been attached to objects in the

pharaoh's tomb, such as quivers, bow cases, and bridles. They were surprised to detect decorative motifs foreign to Egyptian art at the time. Scenes such as fighting animals and goats at the tree of life were typical of Mesopotamian art, and their presence on the objects from Tutankhamun's grave demonstrates how Egyptian artists were cognizant of and influenced by outside cultural styles that had seemingly passed to Egypt through the Levant. Although chemical analyses of the gold artifacts with Egyptian motifs and those with foreign motifs showed that they had different chemical compositions and sources, it is not thought that the eastern-style objects were imported. Instead, they were likely created in workshops specializing in Mesopotamian styles.

—JASON URBANUS

NEWTONIAN WHITEBOARD

Using a photographic technique to survey interior surfaces of Sir Isaac Newton's childhood home, Woolsthorpe Manor, in Lincolnshire, England, conservator Chris Pickup has discovered a doodle of a windmill drawn by the scientist as a young man. The technology, called reflectance transformation imaging (RTI), creates a synthesis of multiple digital images, allowing researchers to identify features invisible to the naked eye. "Each RTI requires over 24 photographs, so each small section is time consuming," Pickup explains. "However, once applied, it allows a deep level of analysis, and the software makes it possible to share files with experts anywhere in the world."



Windmill doodle

Newton was born in 1642 and grew up in the house, returning in 1665 when he left Cambridge during an outbreak of the plague. The National Trust, which manages Woolsthorpe Manor, hopes that finding more of Newton's illustrations will provide insight into the mind of the groundbreaking thinker. "The discovery could be the tip of the iceberg in terms of drawings waiting to be uncovered," says Jannette Warrenner, operations manager at Woolsthorpe. "We know he used the walls as a sketchpad as he explored the world around him, which suggests there are more to find."

—MARLEY BROWN

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FROM THE TRENCHES

NOMADIC CHIC

On the bank of a river in Siberia's Tuva region, archaeologists have unearthed an Iron Age cemetery that held the remains of nobles of the Xiongnu Empire, a confederation of nomads that dominated much of Central Asia in the second century B.C. Tuva would have been on the northernmost fringe of the empire, but living on the frontier evidently didn't keep Xiongnu noblewomen from being fashionable. A team led by St. Petersburg archaeologist Marina Kulinovskaya discovered that many of the women in the cemetery were buried with extravagant jewelry and other accessories. Some graves contained buckles made from bronze or stone that depicted fantastical creatures, as well as bulls, camels, horses, and sheep. Others were studded with turquoise, jade, and other semiprecious stones. Perhaps the most fashion-forward woman was buried with flame-shaped copper pendants. "The meaning of these isn't clear," says Kulinovskaya. "We haven't found anything else like them."

—ERIC A. POWELL

Burial ground, Tuva, Russia



Stone buckle



Bronze buckle



Female burial



OLD WOMAN AND THE SEA

Burial, Alor Island, Indonesia



Sea-snail-shell
fishhooks

In a rock shelter on Indonesia's Alor Island, just north of Timor, archaeologists have discovered five fishhooks buried with a person who died around 12,000 years ago. The hooks, made from sea snail shells, were placed under the chin and around the jaw. It is rare to uncover burials from this period that include grave goods of any type, and this is the oldest known instance of a burial with fishhooks to have been found anywhere in the world.

The researchers believe the deceased was a woman based on the slenderness of the cranium, though they cannot be completely sure as they have not yet excavated the pelvis. "Given how rare grave goods are from the time," says Sue O'Connor of Australian National University, "that this woman of mature age was buried with a cache of fishhooks suggests that she was a fisherperson of some renown or prestige." Four of the five hooks are of the circular rotating style thought to have been used for deep-sea fishing, which has traditionally been seen as the province of men.

—DANIEL WEISS

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ARIZONA: A new theory is challenging the long-held idea that Native American groups living in the Grand Canyon region 1,000 years ago relied predominantly on corn for subsistence. Instead, research suggests that prehistoric communities set controlled fires to burn off the grasses and weeds along the canyon's forested rim. This stimulated the growth of edible plants such as amaranth and chenopodium, wild relatives of quinoa. These plants likely dominated local diets at that time, as pollen analysis of ceramic storage vessels has indicated.



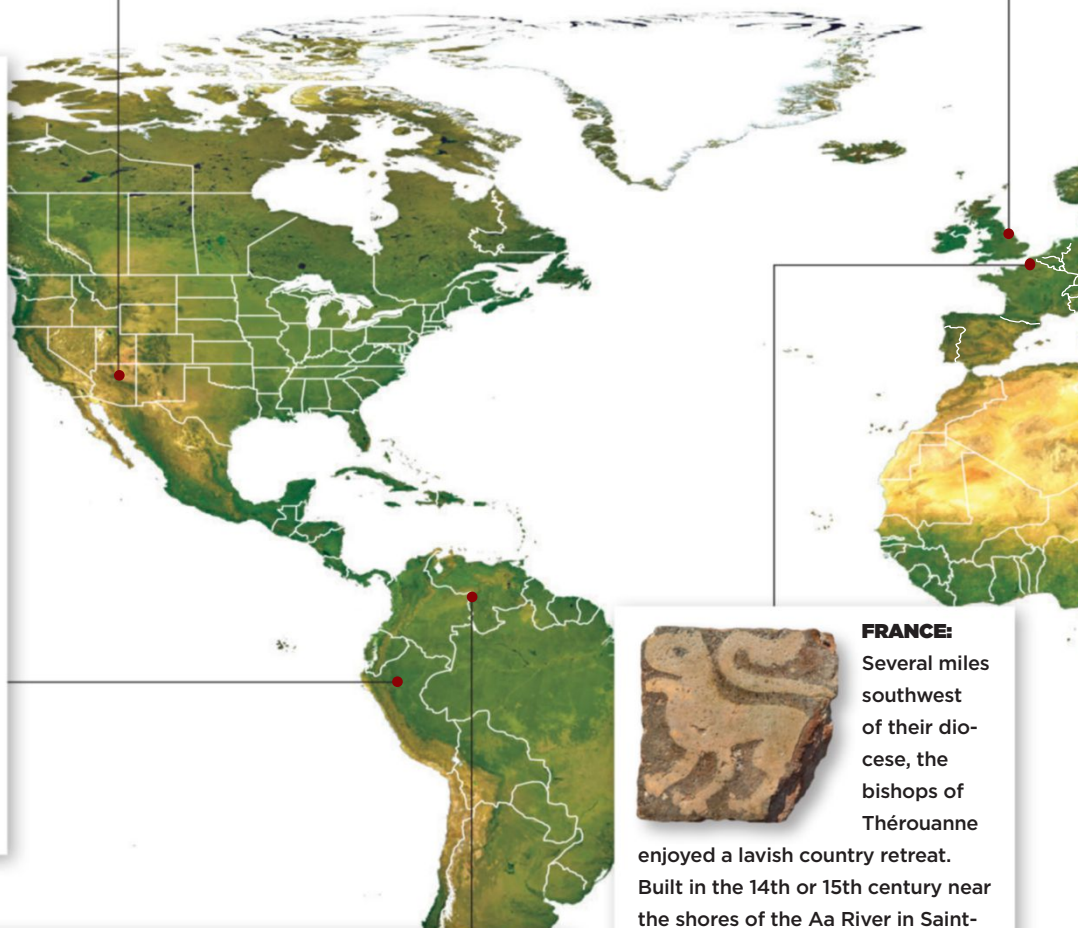
ENGLAND: Perhaps medieval Englanders should have shunned fur. Genetic testing on the skull of a woman who died in Suffolk between 885 and 1015 revealed that she suffered from a strain of leprosy carried by red squirrels. Cases of leprosy were particularly prevalent in East Anglia during that period. The region's close ties with Viking traders and the demand for prized Scandinavian squirrel fur may have been responsible for the disease's introduction, and the bushy-tailed rodents may inadvertently have passed it on to humans.

PERU: As the Incas expanded their empire, they forcibly removed rebellious tribes to maintain a region's stability. The Chachapoyas of northern Peru, known as the Warriors of the Clouds, were thought to have



disappeared after suffering this fate in the 15th century. However, a new genetic and linguistic study

has revealed that pockets of the population living there today retain genetic links to ancient Chachapoyas. Contrary to historical accounts, the Chachapoyas were apparently able to survive dispersal and assimilation after the Inca conquest.



FRANCE: Several miles southwest of their diocese, the bishops of Thérouanne

enjoyed a lavish country retreat. Built in the 14th or 15th century near the shores of the Aa River in Saint-Martin-d'Hardingham, the property was recently investigated prior to the installation of modern flood-prevention infrastructure. The central house was surrounded by a 40-foot-wide moat and contained a large ceremonial room. More than 2,100 square feet of rare and ornate tile flooring that depicts human, animal, and geometric motifs has survived.



VENEZUELA: Thanks in part to historically low water levels, researchers have been able to document a large corpus of rock art located along a section of Venezuela's Orinoco River known as the Atures Rapids. Drone photography recorded most of the engravings for the first time, which include scenes of humans, animals, and cultural traditions. One massive panel contains 93 individual characters across 3,200 square feet of rock. Although still unsure of the engravings' dates, experts believe they were created in both the pre-Columbian and colonial periods.



GREECE: Underwater archaeologists have gained new insight into the construction and configuration of ancient Corinth's main harbor, Lechaion. The city

was destroyed by the Romans in 146 B.C., but was rebuilt a century later and grew into a major port, thanks to advanced Roman engineering. While most of the infrastructure lies underwater today, divers have identified the remains of massive stone moles, wooden and concrete caissons, monumental buildings, and as many as four harbor basins interconnected by canals.



GEORGIA: Chemical analyses of ceramic vessels from two Early Neolithic sites in Georgia produced the earliest known evidence of grape wine and viniculture in the Near East. The sherds of pottery tested positive for tartaric acid, the principal biomarker of grapes and wine, as well as other indicators. This suggests humans were producing wine as far back as about 6000 B.C., nearly 500 years earlier than previously thought. The domestication of the wild Eurasian grape is believed to have first occurred in this region.



PAPUA NEW GUINEA:

When the Aitape skull was discovered in 1929, it was mistakenly thought to belong to *Homo erectus*. But subsequent radiocarbon dating determined it was only around 6,000 years old. Now, a reevaluation of the skull and its findspot has added a new twist. Geochemical analysis of the sediments in which the skull was embedded suggests they were deposited miles inland by a powerful paleo-tsunami, making the skull perhaps part of the world's oldest known tsunami victim.



ISRAEL: Sometimes important archaeological relics are found in unexpected places. This was the case when archaeologists recently noticed a lioness statue within an unassuming pile of dirt and modern debris at the site of el-Araj near the Sea of Galilee. The basalt relief carving weighs 1,320 pounds and dates to between the 4th and 6th centuries A.D. It may have once adorned a nearby synagogue. Some experts believe el-Araj is where the biblical settlement of Bethsaida and the later Roman town of Julius were located.



SOUTH AFRICA: After 20 years of painstaking excavation, cleaning, and reassembling, the virtually intact skeleton of the *Australopithecus* hominid known as Little Foot has been unveiled. Bones from the 3.67-million-year-old human ancestor were first identified in the 1990s within the Sterkfontein caves northwest of Johannesburg. Little Foot represents the most complete *Australopithecus* ever discovered and may provide unparalleled information about the origins of humankind, as well as the appearance, anatomy, and movement of early human relatives.

HOW TO SURVIVE

Peru's Casma state endured unpredictable El Niños and centuries of drought

by LIZZIE WADE



CLIMATE CHANGE

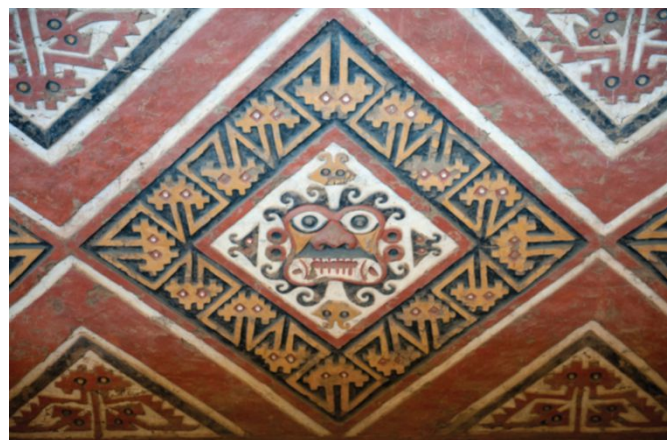


The ruins of the city of El Purgatorio spread across two square miles of northern Peru's Casma Valley. From A.D. 700 to 1400, its people successfully adapted to a period of extreme environmental instability.



THE TURN-OFF FROM the Pan-American Highway into Peru's Casma Valley, a five-hour, 200-mile drive up the coast from Lima, reveals a forbidding landscape. The foothills of the Andes loom over a bone-dry desert interspersed with sand dunes. "Except for maybe the occasional cactus, it's all just sand and rocks," says Melissa Vogel, an archaeologist at Clemson University who has been traveling there to excavate since 2004. She studies Peru's little-known Casma state, which had its capital city in this valley between A.D. 700 and 1400—a period during which the environment was even more hostile. Devastating droughts punctuated by unpredictable storms had already brought one dominant culture, the Moche, to its knees. So when Vogel first visited this area she expected to find, at best, evidence of a small city eking out an existence.

Instead, she uncovered signs of a flourishing society. The city of El Purgatorio—named for a nearby mountain called that by Spanish conquistadores, who were perhaps reminded of the peak Dante climbs in the Purgatory section of his *Divine Comedy*—once covered about two square miles, a far greater area than Vogel had imagined. "I was shocked," she says. "It's enormous." Enclosed plazas dotted the elite heart of El Purgatorio, with similar, more modest structures anchoring



A gold and copper plaque (top) and a wall relief (above) both depict a Moche god now known as the Decapitator. The Moche, who preceded the Casma, were ruled by priests who drew their authority from such fearsome deities.

middle- and lower-class neighborhoods. And most of it was still standing, preserved by the desert environment and protected by the site's remote location.

As Vogel mapped El Purgatorio and excavated both the center and outlying neighborhoods, she began to piece together

how the Casma ran their government and what commoners' daily lives were like. She quickly realized that, unlike their predecessors the Moche, the Casma didn't build grand pyramids or make ornate art. Casma pottery, architecture, and jewelry were unfussy, even humble. This, Vogel realized, might have been an adaptation to the changing climate and the political uncertainty it sowed. "We know there were periods in Peru's past when there were short-term and sometimes very long-term changes in the weather," says Jeffrey Quilter, an archaeologist at Harvard University who studies Peru's north coast. "The perennial question, whether it's Peru or anywhere else, is, to what degree do climatic events have long-term impacts on cultures?" Casma, unrecognized as a significant state until Vogel's work, apparently offered a beacon of stability during what scholars have considered a tumultuous time. Vogel has discovered that while the Casma weren't great conquerors and didn't leave behind extravagant tombs, they did something much more impressive—in the face of climatic and political chaos, they survived, and even thrived.

THE CASMA WAY OF LIFE was a sharp departure from that of the Moche, who dominated the north coast of Peru from about A.D. 200 to at least 650, and until 900 in some areas. For these people, survival in one of the world's most arid environments depended on staying on the gods' good side.

Rivers snaking down from the mountains provided the Moche with just enough water for farming, and people clustered in valleys around the precious freshwater flow, digging irrigation ditches to grow crops such as maize. But, at nearly any moment, the environment could turn on them. Every few years the surface of the Pacific Ocean off South America would grow warm, a phenomenon now known as El Niño. This seemingly subtle change can wreak havoc on weather patterns worldwide, bringing drought to some parts of the globe while drenching others with heavy rains. In Peru's coastal desert, an El Niño means torrential rain. In the first millennium A.D., rivers would flood, adobe houses would wash away, and the usually life-giving valleys would be transformed into death traps.

Balanced on this razor's edge, the Moche turned to religion to keep them safe. The most powerful people in Moche society were priests and priestesses, and their authority was based on their ability to communicate with and even embody the gods. On platforms atop huge adobe pyramids, priests dressed as deities—named Wrinkle Face and the Decapitator by archaeologists—would slit captives' throats and drink their blood from goblets. Detailed depictions of such scenes appear again and again in Moche art, and some elites were even dressed as gods when they were buried. Moche priests and priestesses "were like demigods," says Michele Koons, an archaeologist at the Denver Museum of Nature and Science



A pile of stone rubble stands in a walled public plaza at El Purgatorio. It would have been the scene of frequent feasts thrown by Casma rulers in order to maintain social order during trying times.



A simple adobe frieze decorates a raised platform that was constructed next to one of El Purgatorio's public plazas.

rather in a constellation of cities and towns linked by a shared religion and the culture that went along with it. Compared to the riches flaunted by the priests, Moche commoners didn't enjoy many luxuries. But they trusted that their leaders would keep them safe by staying in constant contact with the gods. And it seemed to work—until the weather changed for good.

Beginning around A.D. 550, a series of particularly harsh El Niños struck the north coast. Excavations in Moche cities of that time have revealed layers of mud and sand, indicating rapid shifts between extreme wet and dry weather. In one Moche city, Vogel says, sacrificial victims were left lying facing down in the mud, an unusual practice that hints at the religious authorities' desperation. The deluge needed to create that amount of mud in the desert would have been devastating, Vogel says. "Nothing is built to handle it. This area is usually so dry that folks didn't even bother to fire their bricks. They're just sun-dried adobe. You subject that to a torrent of water coming down from the valley, and it's gone. It's just a pile of mud." Meanwhile, the dry periods in between storms became longer and longer, finally extending into a devastating drought recorded in ice cores from Andean glaciers. Crops failed and sand dunes encroached upon Moche cities. "It seems like there are some serious disturbances occurring," says Koons.

The Moche began to falter. Cities turned away from traditional Moche rituals and architecture, and new ceramic styles sprang up, Koons says. By the time El Purgatorio was built, around A.D. 700, after about 150 years of climate chaos, the Moche had definitively lost their grip within the southern part of their territory, which had once extended to just north of the Casma Valley. "If you have a government that is built on claiming to have control over what seem to be supernatural events, climate change can lead to real political instability,"

who studies the Moche. "They're telling you, 'Follow us, and everything will be great.'" The Moche did conquer some areas. But up and down the north coast of Peru, people found this religion compelling—or protective—enough to convert by choice to the Moche way of life. According to Quilter, that resulted not in a centrally administered, unified state, but

The Casma people did not invest time in making elaborate pottery like their predecessors the Moche, instead preferring to create ceramics with modest decorations, such as these.



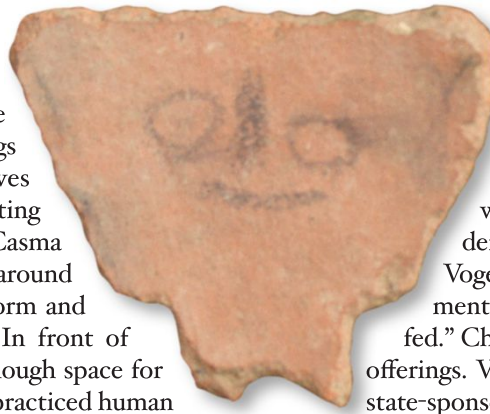
Vogel says. “People start to say, ‘You’re not doing your job. You told us you could take care of us.’”

Vogel thinks the people living in the Casma Valley saw the need to do things differently. “They’re taking their lives back,” she says. Rather than constructing enormous pyramids for rituals, the Casma structured the center of El Purgatorio around walled plazas, each with a raised platform and a labyrinth of rooms surrounding it. In front of the platform, the biggest plazas had enough space for hundreds of people. The Casma rarely practiced human sacrifice, and their religion doesn’t appear to have invoked fantastical or monstrous gods. “It’s not about how they can terrify the populous into submission,” Vogel says. Casma rituals weren’t gory spectacles. They were feasts, designed to provide for the entire populace.

The whole of El Purgatorio seems to have been dedicated to throwing these frequent feasts. Vogel found the remains of serving plates and bowls in the public plazas, as well as mollusk shells and one large trash deposit of maize—an unusual find, because these ceremonial spaces were kept clean between events. The animal and plant remains Vogel sifted from the soil in both plazas and houses showed that the residents of El Purgatorio were eating mostly shellfish. The remains of maize and a tropical fruit called guanabana were also particularly abundant. But Vogel found no farming or fishing tools in the city, not even in the lower-status neighborhood where small houses were jammed together on a steep hillside. That meant the city’s food was being produced elsewhere and brought in. El Purgatorio’s rulers must have commanded a trade network extending from tip to toe of their valley, and possibly in adjacent valleys also occupied by the Casma, Vogel says.

The lower-status people in El Purgatorio didn’t have to grow corn or catch fish because they had a different job to worry about. David Pacifico, an archaeologist at Cardinal Stritch University who led the excavation of their hillside neighborhood as a graduate student, found hundreds of grinding stones, heavy anvils with a smooth flat top, and an accompanying roller, to break down tough maize kernels. In some houses, there was just one grinding stone. In others, two, three, or four were lined up in a row. And in a neighborhood’s central patio—a more humble version of the plazas downtown—Pacifico found 11 grinding stones lined up in a row. “The fact that they’re aligned suggests that you’re not in a circle all talking to each other while working,” he says. “They are doing some massive surplus production of food there.”

These workers were likely making chicha, a beer made from maize that played a central role in many Peruvian cultures and was especially important for feasts. Chicha spoils quickly, so such intensive production would only have made sense if the city required large quantities to be consumed at once. Pacifico concluded that El Purgatorio’s lower classes must have spent much of their days grinding and fermenting corn for the enormous quantities of chicha required for the city’s frequent



A broken piece of a ceramic bowl unearthed at El Purgatorio bears the quick sketch of a smiling human face and is thought to be an indication of the Casma sense of humor.

feasts, which they likely attended along with upper-class people. “Yes, there are definitely going to be haves and have-nots,” Vogel says. But through feasting, the government “can help make sure that everybody gets fed.” Chicha and shellfish were probably the main offerings. Vogel thinks the Casma government used state-sponsored feasts as a way to collect and redistribute these resources, making sure everyone got what they needed even as the drought dragged on for centuries. Compared to the Moche, Vogel believes “the Casma’s way of ruling was far more centered on economics.” Their strategy seems to have kept inequality in check as well. Although high-status and low-status people lived in different neighborhoods, symbols of wealth were more muted than they had been in the extravagant Moche society. Even Casma jewelry was practical. Some women were buried wearing necklaces decorated with copper ornaments that Vogel initially thought were beads. But upon closer inspection, she realized they were actually spindle whorls, tools used to spin cotton into thread for textiles.



Necklaces made out of copper spindle whorls were discovered in the burials of some women in El Purgatorio.

The Casma survived for 700 years, enduring centuries of drought along the way. “That’s a long time for a culture that we knew so little about,” Vogel says. “They weren’t just a flash in the pan.” Around 1400, El Purgatorio was conquered by the Chimú, a northern people known for their extensive bureaucracy—which perhaps made them even more effective at brokering trade and redistributing resources than the Casma. Maybe, says Pacifico, the improved system appealed to the practically minded citizens of El Purgatorio. He and Vogel did not find signs of violence at the city’s end. Instead, they saw that some of El Purgatorio’s plazas were ritually closed off, suggesting that residents had time to leave peacefully, Vogel says. Even the Casma’s decline was orderly, a fitting end to a state dedicated to warding off hard times. ■

Lizzie Wade is a journalist based in Mexico City.

Fresco, House of Livia, Prima Porta, 1st century B.C.



The Archaeology of Gardens



People have created gardens across the world and throughout time, and these spaces have been an essential part of the human experience. Gardens such as Eden, and also Gethsemane, where Jesus prayed and his disciples slept the night before his crucifixion, are, to this day, regarded as sacred. Gardens are also a key element in some of the best-known myths. One of the Labors of Hercules required the hero to steal, from a place on the far edge of the world called the Garden of the Hesperides, the golden apples that the goddess Hera had given to her husband Zeus as a wedding present. The palaces of the ancient Near East are known to have had spectacular gardens, including the Hanging Gardens of Babylon, one of the Seven Wonders of the Ancient World, whose precise location is still unknown.

Beginning in the mid-twentieth century, archaeologists started to apply the full range of methods available to identifying and understanding ancient gardens. As technology has evolved, researchers have not only been able to discover where gardens were located and, generally, what they were used for, but also to determine which individual plants were cultivated and how long they thrived. Along with written sources, this has allowed researchers to see how gardens changed over time and what they can tell us about the people and cultures who nurtured them.



Fresco, Villa Arianna, Stabiae, 1st century A.D.

Villa of Poppaea, Oplontis, 1st century A.D.



VILLA GARDENS

Bay of Naples, Italy

Beginning in the second century B.C., Rome's most prominent families began to build luxurious country estates for which exquisitely designed gardens were essential. The Bay of Naples, with its sweeping vistas and cool breezes, became one of the most popular destinations. Today, the coastline is littered with the ruins of large villas and their opulent gardens, buried and preserved by the eruption of Vesuvius in A.D. 79. According to Cornell University's Kathryn Gleason, it is only recently that archaeologists have truly begun to understand the complexity and various functions of a villa garden. "A design might have been initiated as a display of wealth, but also might provide simple pleasures, such as shade, produce, a place for children to play, for weary politicians to find retreat, or for young people to make love," she says. Two of the best-preserved gardens are found at the Villa of Poppaea and the Villa Arianna, located at Oplontis and Stabiae, respectively. These grand spaces contained porticoes, footpaths, fountains, and a variety of trees. In recent decades, excavations in both places have also revealed the remains of planting beds, tree root cavities, carbonized plant parts, and even in situ planting pots. "These features allow us to understand the design and layout, and thus much about the experience of the garden," says Gleason, "which is something that only archaeology permits in a fully spatial sense." —JASON URBANUS



Dragon
Skin root
casts, Villa
Arianna, 1st
century A.D.

Planting pots, Villa of Poppaea



COMMERCIAL GARDENS

Cerén, El Salvador

The Maya village of Cerén was home to some 200 people when it was buried by a massive volcanic eruption around A.D. 600. The resulting preservation has revealed that many of its households carved out particular types of economic activity for themselves—and one was the gardener of the community. Archaeologists have learned that one property's garden included around 70 agave plants grown for their fiber, which was used to make rope and twine, as well as fast-growing, sturdy cane that reinforced the wattle-and-daub walls of the village's structures. Numerous large chili bushes and at least one cacao tree provided specialty food products. "They produced all kinds of things that were way beyond what they could consume themselves," says



Agave

Payson Sheets of the University of Colorado Boulder. He believes that the garden's surplus was traded with others in the village and exchanged at nearby markets for more exotic items such as obsidian blades, greenstone axes, and polychrome ceramics.

—DANIEL WEISS



Household, Cerén, 7th century A.D.

MEDICAL GARDENS

Naantali, Finland



Naantali Church, 15th century

Monasteries and convents in medieval Europe were bastions of literacy and of expertise with medicinal herbs unknown by the general population. At the site of the Naantali Cloister in southwest Finland, scholars have employed a combination of archaeological, historical, and botanical research to learn what types of plants the Bridgettine monks and nuns who



Sage, 15th-century illustration

lived there grew. Archaeobotanist Teija Alanko and her colleague Kari Uotila sorted and radiocarbon dated 4,561 plant macrofossils uncovered during excavations around the Naantali church, the only surviving building of the cloister, which was occupied between 1443 and 1554. In addition to dietary staples such as rye, barley, and other cereals, the team discovered several species with healing properties, including henbane, greater celandine, St. John's wort, nettle, and juniper. They can't, at this time, be sure that the plant remains derive only from the garden, since many could have been collected or cultivated elsewhere. However, radiocarbon and archaeological dates have allowed Alanko and Uotila to determine which plants came in and out of use over time from before the cloister's founding through its dissolution during the Reformation. "We found macrofossils of useful plants for food, dyeing, and medical purposes in Naantali," Alanko explains. "This suggests a possible combined kitchen and medicinal garden." —MARLEY BROWN

FUNERAL GARDENS

Luxor, Egypt

Mandrake,
14th-century
illustration



Herba teoderis, 14th-century illustration



The *Tale of Sinuhe*, a work of ancient Egyptian literature dating to the 12th Dynasty, around 1900 B.C., reads, "...and there was made for me a sepulchral garden, in which were fields, in front of my abode, even as is done for a chief companion." The existence of funerary gardens is also known from representations in tombs from as early as the 6th Dynasty (2323–2150 B.C.). But no archaeological evidence had been found until last year, when, in front of the rock-cut tomb of a high-ranking 12th Dynasty official of the Theban court, archae-



Tomb garden, Luxor, 1900 B.C.

ologist José Manuel Galán of the Spanish National Research Council uncovered a well-preserved garden buried under more than 15 feet of debris. The 10-by-6.5-foot rectangle was raised off the ground and divided into square beds. According to Galán, the Egyptians would have grown vegetables, fruits, and flowers intended as fresh offerings for the deceased, as well as small trees and shrubs. Galán's team found one of these shrubs, a tamarisk complete with roots and trunk, in the corner of the garden next to a bowl of dates and other fruits, perhaps meant as offerings. In the next field season, he plans to retrieve seeds and pollen to learn what plants were available in ancient Thebes and which were chosen for religious and funerary purposes. —JARRETT A. LOBELL



Preserved dates, Luxor

URBAN GARDENS

Aphrodisias, Turkey



Portico sculpture, South Agora, Aphrodisias, 1st century A.D.

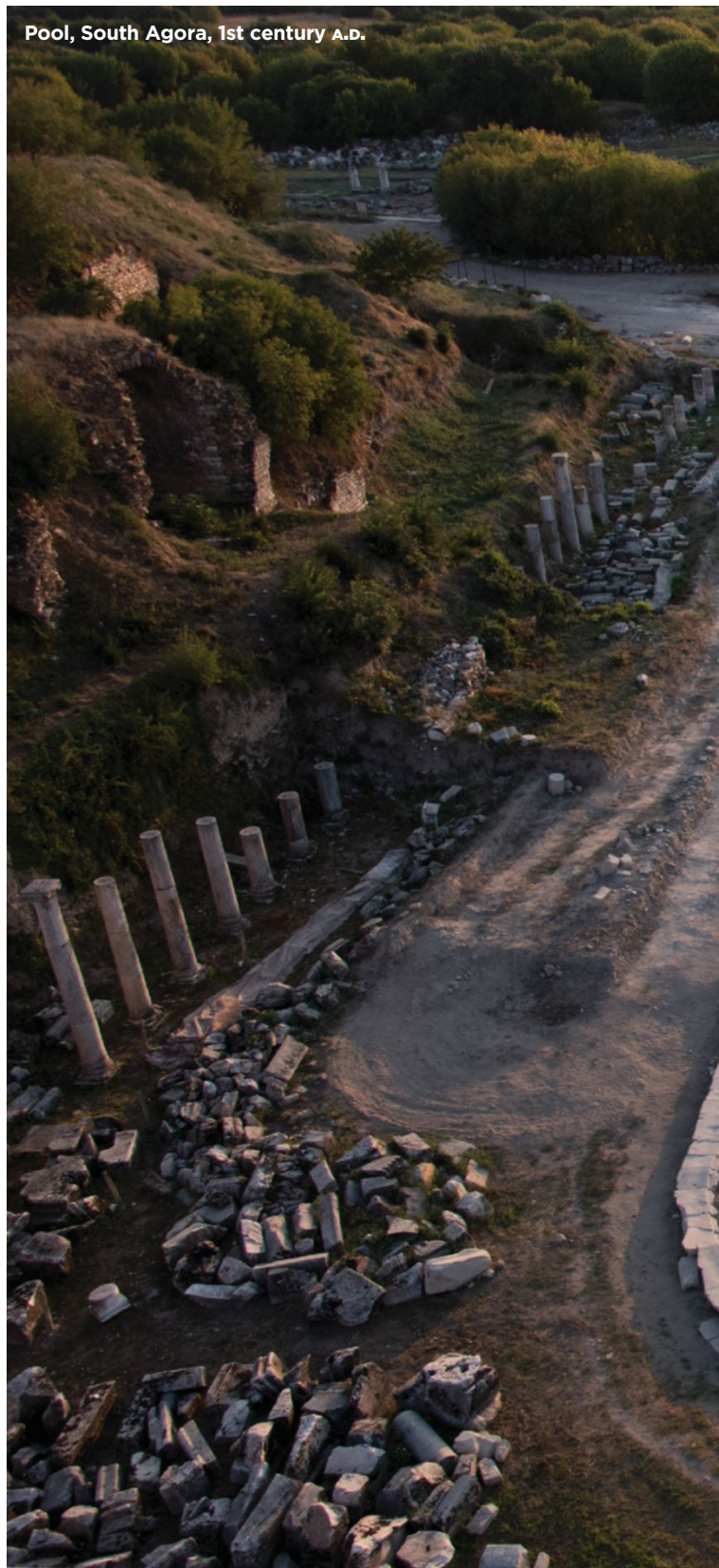
The South Agora of Aphrodisias, located in southwestern Turkey, was one of two public squares within the ancient city. It was built during the first century A.D., and had been previously interpreted as a commercial complex. However, recent archaeological work has shown that the space functioned in quite the opposite capacity, and was instead an urban park, equipped with a monumental pool, fountains, promenades, trees, and other greenery. “It had the grandeur of public city architecture and design, but was intended for relaxation, strolling, and some retail,” says University of Oxford archaeologist R.R.R. Smith. The enormous pool at the complex’s center measures 575 feet long and 82 feet wide



Cretan date palm

and was bordered by marble benches, some even inscribed with gaming boards. Excavations and archaeobotanical analysis of plant remains revealed that rows of palm trees (likely Cretan date palms) and other plants once flanked the pool, providing not only a decorative element but also ample shade. These palms were not native to Aphrodisias, but would have been transported from coastal locations in southwest Asia Minor. This 3.7-acre park would have been very expensive to build and maintain. With its shaded walkways, flowing water, and lush vegetation cared for by an association of professional gardeners, it seems to have been designed for no other purpose than to provide the city’s inhabitants with a place of leisure. “It was highly unusual for its time,” says Smith. —JASON URBANUS

Pool, South Agora, 1st century A.D.





SCIENTIFIC GARDENS

The Woodlands, Philadelphia

In colonial America, Philadelphia was home base for a community of ardent plant enthusiasts who came together on the banks of the Schuylkill River. There they competed to cultivate exotic specimens, fostering an Enlightenment-era spirit of inquiry that eventually led to the discipline of botany. At the Woodlands, a private estate built between the 1760s and 1780s, wealthy collector William Hamilton amassed what was possibly the largest collection of flora in the country and constructed a state-of-the-art greenhouse known to have been

Bookplate, The Woodlands, Philadelphia, 19th century



Illustration by Bartram, 18th century

visited by Thomas Jefferson. Hamilton, with the help of his friend and neighbor, seed dealer William Bartram, created a garden dedicated to aesthetics and to building a scientific collection of plants from around the world. According to archaeologist Sarah Chesney, who identified and excavated the Woodlands' greenhouse, the structure is an example of Hamilton's fervor for this

project. "You have to be committed to pour resources and time into what was really a non-essential building," she says. "Its remains are now valuable physical evidence of this remarkable and transient exchange of plants and ideas."

After Hamilton's death, the estate was eventually sold and the gardens gave way to a public cemetery in the 1840s. "We have a nineteenth-century cemetery superimposed on an eighteenth-century estate," explains the Woodlands' executive director Jessica Baumert. "The company used as much of the infrastructure that was already in place as they could to design the cemetery, and that will provide us with a template as we seek to learn more about the Woodlands' rich garden history." —MARLEY BROWN

ROYAL GARDENS

Seoul, South Korea

The front yard of a Korean home was traditionally left empty, while the backyard, which sometimes led to small nearby mountains, was cultivated as a garden. This held true for palace gardens as well. A pond and a pavilion from which to take in the surrounding landscape were considered vital elements. Such is the case at Hyangwonjeong in Gyeongbokgung Palace. Hyangwonjeong, which means "a pavilion from where scent spread," was created between 1867 and 1873 on a small island constructed in the middle of a pond.

Hyangwonjeong is currently being excavated by the Ganghwa National Research Institute of Cultural Heritage. Archaeologists have found that the bridge that connects the pavilion to the land, at more than 100 feet, was the longest wooden bridge in its day. This bridge was destroyed during the Korean War and has now been reconstructed. Sadly, this is also near the spot where Queen Min (or Empress Myeongseong) was assassinated by the Japanese in 1895, one of the preludes to Japanese colonial rule of Korea. —HYUNG-EUN KIM



Gyeongbokgung Palace, 20th century



Rake, 1st century A.D.



Carbonized bread, 1st century A.D.



Fresco, House of the Centaur, Pompeii, 1st century A.D.

FOOD AND WINE GARDENS

Pompeii, Italy

Evidence continues to reveal much about the quality of life of the residents of ancient Pompeii. The city created an intricate and robust system for the local production of food and wine. Researchers have long been aware of frescoes, found in many surviving houses and villas, depicting plants and the pleasure of eating and drinking. Remains of triclinia, or dining rooms, and of food stalls, bakeries, and shops selling the fish sauce *garum* are abundant.

Garden archaeology as a discipline was pioneered in Pompeii in the 1950s when archaeologist Wilhelmina Jashemski began to excavate areas between the remaining structures. She discovered that homeowners planted flowers, dietary staples, and even small vineyards. “From the oldest type of domestic vegetable garden, the *bortus*, to ornate temple gardens,” explains Betty Jo

Mayeske, director of the Pompeii Food and Wine Project, “you see evidence of cultivation in nearly every available space in Pompeii.” It appears that both grain and grapes were grown in small, local contexts. “There was a bakery on practically every single corner and the mills were there too, as well as a counter room and large ovens,” she says. “The whole production process took place there, and there are also several similar examples of small-scale vineyards.” One of Jashemski’s innovations was to apply the practice of making molds of the dead, known since the 1860s, to making molds of individual plants. “Casting had been done in cement and plaster on human remains for years,” Mayeske says, “but Jashemski used that technology to cast the plants’ roots, which helped definitively identify all of these gardens and vineyards.” —MARLEY BROWN ■



ANTHROPOLOGISTS ONCE BELIEVED that tool-making was humanity's defining characteristic, elevating us above other animals. But beginning in the 1950s, when field biologists reported on chimpanzees using sticks to dip for ants, our toolmaking began to seem less than special. "Now we must redefine tool, redefine Man, or accept chimpanzees as humans," pioneering anthropologist Louis Leakey wrote in 1960.

We haven't accepted chimpanzees as human. Nor have we redefined "tool." Rather, over the last 50 years, the idea that tool use is the defining characteristic of human beings has been discarded. Nowadays we know that chimps, crows, otters, dolphins, and many other species use some sort of tool to exploit their environment. This realization has led anthropologists to redefine "Man," looking for other traits that set humans apart. Today, complex social organization and language are the focus of much scholarly attention.

In recent years, however, a handful of archaeologists have begun looking at tools in a new way. Just because tools aren't exclusive to humans, they posit, doesn't mean they weren't an important driver in our evolution as a species. Tools have certainly shaped us: The ability to cut, prepare, and cook food, for example, meant our jaws could be less powerful and gave us access to more calories for less work. From stone implements to the iPhone, the kinds of tools modern humans and our distant ancestors made—and how we learned to make them—may have shaped our evolutionary path. It's the complexity of our tools, the forethought they require, and the frequency with which we use them that set modern humans and our closest relatives apart.

Inconveniently, it's hard to learn much about forethought, language, and learning from the archaeological record. Our evidence of the deep past is composed primarily of fossilized bone fragments and stone tools. Neither can tell us much about how our ancient human relatives thought, or what combination of cognitive advances and environmental conditions prompted them to begin making ever more complex tools. An arc more than three million years long, beginning with smashing rocks into sharp pebbles and now entering our modern era of cell phones, electric cars, and spacecraft, remains shrouded in mystery. Rather than relying on the fossil record, some archaeologists wondered if examining the brains of modern humans might offer an entirely new kind of access to what went on deep in the ancient past.

By studying brain activity during toolmaking and comparing it to what neuroscientists already know about how the brain processes speech and language, they can explore ideas about how—or if—the two traits are connected. "With neuroimaging, we're beginning to test the idea that language uses the same structures of the brain as stone toolmaking," says Shelby Putt, a researcher at the Stone Age Institute in Bloomington, Indiana.

Here, the archaeological record has a lot to say. Archaeologist and hobby flintknapper Alex Woods, now working for Colorado State University's Center for Environmental Management of Military Lands, says that, to the trained eye, stone tools are unique windows into the thoughts of long-gone beings that populated the branches of humankind's family tree. "You can see a tool, even one that's millions of years old, with four or five mistakes in a row that were part of a thought process. It's the only time in archaeology where

An ancient hand ax (below, far left) from the site of Boxgrove in England and an array of experimental examples made by modern flintknappers at various skill levels



you can take a quantum leap back in time into the mind of a person,” Woods says. “It’s problem-solving, fossilized.”

THE EARLIEST RECOGNIZABLE stone tools appear 3.3 million years ago. They’re nothing more than rocks smashed together, with the resulting sharp chips and splinters used as crude cutting tools. “There’s not a lot of deep thought going on,” says Putt. Chimpanzees in captivity use similar techniques to this day.

Beginning around 2.5 million years ago, something started to change. Hominins began refining their technique by fashioning rocks themselves into cutting tools. These shaped stones—named Oldowan tools after the storied Olduvai Gorge, an area in Tanzania that has yielded ample evidence about our distant ancestors—don’t look like much. “Most people, if they’re unfamiliar with stone tools, would pick up something from the Oldowan and not realize it was tampered with,” Putt says.

For archaeologists, however, the Oldowan represents a glimmer of something more complex, a decisive step forward. “They’re holding them in their hands and precisely aiming them at hammerstones,” rounded rocks that toolmakers used to chip flint, Putt says. “The creatures making Oldowan tools were very intelligent, but I don’t know if we would think of them as human.”

Things began to shift again around 1.7 million years ago. Beginning in Africa and spreading into Europe and Asia, the Oldowan gave way to something altogether different. Early hominins began making clearly identifiable hand axes. Sometimes called bifaces, they’re teardrop-shaped chunks of stone between four and eight inches long. They can range from rough-hewn to refined, but they’re clearly purposely shaped tools.

These practical, versatile tools, first identified in France in the nineteenth century and called Acheulean after the village of Saint-Acheul, represent a significant leap forward. The tools’ shape and complexity required their makers to think several steps in advance. These were the first flintknappers, people who deliberately shaped raw pieces of flint, or cores, into tools by applying pressure to the stone. “They start to think about the shape of the core, not just the flakes,” Putt says. The sharp flakes chipped from the core could also be used as tools. The flakes were used to cut, scrape, pierce, and kill, and were the mainstays of human tool use until the invention of metallurgy. Acheulean toolmakers sought out specific types of stone, sometimes traveling for miles looking for the best raw material, carrying large pieces over long distances, and then using them to make smaller tools.

Watching dozens of volunteers struggle to make hand axes during her Ph.D. project convinced Putt that Acheulean tool-making took more than muscle memory, animal instinct, or luck. “You have to be able to reimagine what the end product might look like once your dreams are shattered,” Putt says about the effect of a misplaced blow. “I have a vision of what I want this to look like, but, oh crap, I split the core, and now I have to revise my vision.”

This kind of planning, learning, and control probably required boosted brain power—something fossilized skulls show hominids were developing during the Acheulean. “There’s a doubling of brain size, and more human-like proportions in the body,” Putt says. “It seems like there’s so much going on—changes in stone tools, in brain size, in body size, and human ancestors are leaving Africa to explore different parts of the Old World.”



IMAGING THE PAST

What stone toolmaking and neuroscience can tell us about what it means to be human

by **ANDREW CURRY**

Our ancestors stuck with Acheulean-esque hand axes longer than any other tool type. The distinctive axes were used for chopping and cutting all across Africa, Asia, and Europe for nearly 1.6 million years—from their appearance around 1.7 million years ago to 100,000 B.C. The tools support a rich tale. “I would argue that this is the most important period in human evolution,” says Putt. “Anatomy, behavior, cognition—all point to a more human type of being.”

THE ACHEULEAN TRANSITION has sparked a long-running debate: What role, if any, did toolmaking play in our evolution? This is where it gets even more interesting. Early hominids must have been capable of making tools before they began making them. “You can’t have the behavior occurring before you have the capacity to produce that behavior,” says Emory University evolutionary anthropologist Dietrich Stout.

But once toolmaking began, it may have been driven by other abilities, coevolving with language, social interaction, advance planning, and other behaviors. Hominids who were able to quickly learn to make useful tools and then teach their offspring the skill would have had a better chance of passing their genes on. Natural selection, the theory goes, would favor the toolmakers who were able to both learn and communicate. “The idea is that stone tools and language coevolved in humans,” says Natalie Uomini, an archaeologist at the Max Planck Institute for the Science of Human History. “It’s one of the biggest open questions in human evolution right now.”

Over the past two decades, archaeologists have used neuroscience research to try to move beyond speculation. The field has progressed in fits and starts since the 1980s, when machines were first used to look at human brain activity in real time. Anthropologists suggested the technology’s potential as a research tool as early as 1990, but it took another decade for Emory’s Stout to publish the results of the first stone tool experiments that used a brain scanner.

Part of the delay had to do with the limitations of the technology. The most powerful and common brain scanning devices are functional MRI (fMRI) machines. MRI scanners use massive magnets that require people to lie absolutely still during scans, making direct observation of toolmaking challenging. Researchers have come up with some creative workarounds. In one early attempt, Stout had study participants make flint tools for 45 minutes. He then

put them in a PET scanner, which measures the accumulation of glucose, the body’s basic fuel, in different parts of the brain. “The thought was that glucose would accumulate in the neurons that were most active,” Stout says.

Experimenting with modern people to draw conclusions about the deep past poses other problems. Stone toolmaking isn’t a common skill in modern times, for example, but Stout wanted to capture the brain activity associated with making the tool, not learning how to make it. So before they could be scanned, people needed to learn to knap flint—easier said than done. We may sneer at the supposed simplicity of “Stone Age” technology, but volunteers in one of Stout’s experiments needed an average of 167 hours of practice to produce passable Acheulean hand axes.

Today, a pile of broken rock 10 feet across and five inches deep—more than 3,000 pounds of chipped flint—outside Stout’s office at Emory testifies to the thousands of hours volunteers have put into learning to make tools. “I can explain golf in a few minutes, but getting your swing down can take years,” Stout says. “Toolmaking is difficult to do, comparable to a sports skill or playing a musical instrument.”

In other experiments, Stout trained participants to knap flint and then scanned them in an MRI machine while they watched videos of someone else making tools. Using such workarounds, Stout, Uomini, and others pinpointed areas in the brain that were particularly active during Acheulean toolmaking: the right inferior frontal gyrus, for example, a region that experiments have shown helps with impulse control and juggling multiple tasks.

Stout also showed that toolmaking is capable of rewiring the brain. In another experiment, brain scans showed that the more a person practiced knapping flint, the more brain matter built up in the regions responsible. And in a recently published study, Stout worked with primate specialists to show that the brain circuitry connecting the right inferior frontal gyrus to the rest of the brain was much more developed in humans than in chimps.

Altogether, Stout argues, there is powerful evidence that toolmaking helped shape the modern human brain. What Stout’s



An Oldowan tool (above) from the site of Omo in southern Ethiopia and an experimental Oldowan core (left) fashioned by a participant in a study designed to isolate the region of the brain used for toolmaking

experiments haven't shown yet is whether language was also a required part of the package. "It's very controversial whether early hominin species had language," says Uomini. "For me, the big question is, How do language and stone toolmaking draw on similar brain areas? Are they overlapping brain areas, or not?"

If they are, it would be reasonable to guess that language goes a long way back. Is it possibly a critical clue to our evolution as a species and what differentiates us from other animals, including our close primate relatives? John Gowlett, an anthropologist at the University of Liverpool, argues that the ability to plan chains of actions—such as those that go into forming sentences or making Acheulean tools—is an essentially human trait. "Animals like us are unleashed by language. We have past, present, and future," Gowlett says. "Other animals are tied to the present."

FOR THE LAST EIGHT YEARS, Putt has been working to test the idea that tool use and language involve the same brain areas. Early on, she turned to a lab on the University of Iowa campus dedicated to using a new brain scan technology called functional near-infrared spectroscopy (fNIRS). Unlike the more familiar fMRI, which requires people to lie motionless in a huge apparatus, fNIRS is portable and allows subjects to move and work while wearing the scanner, whose sensors are nestled against the scalp using a special snug cap. The technique works by shining infrared light through the scalp and skull into the brain—certain wavelengths pass easily through skin and bone—and measuring how much light is absorbed.

The technique works because blood that is carrying oxygen soaks up light at a different rate than blood that has already delivered its payload of oxygen to active brain cells. Brain regions that are working stand out from regions at rest. "If you're using one part of your brain more actively, it's going to be more oxygenated," Putt says. "We can measure in milliseconds what's happening and pinpoint, with great accuracy, where it's happening."

Over the course of several years, Putt trained two different groups of volunteers to make Acheulean-style stone hand axes. Both groups watched a video of Alex Woods shot to show only his hands at work. The first group watched him while listening to his instructions; the second watched the same video, but with the sound turned off. At first, Woods was deeply skeptical. "Sit down with a bunch of students, with technology they hadn't even seen, and try to get them to make it with no verbal instruction whatsoever?" he recalls

An Acheulean hand ax (left) from the site of Omo and an experimental teardrop-shaped sharp-edged tool (below) made in the same toolmaking study

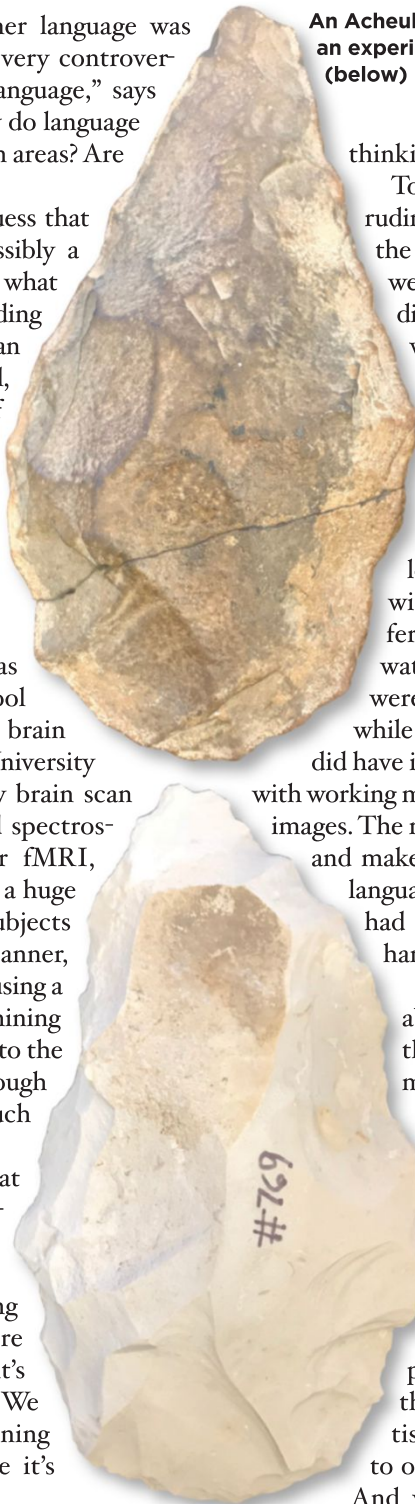
thinking. "There's no way."

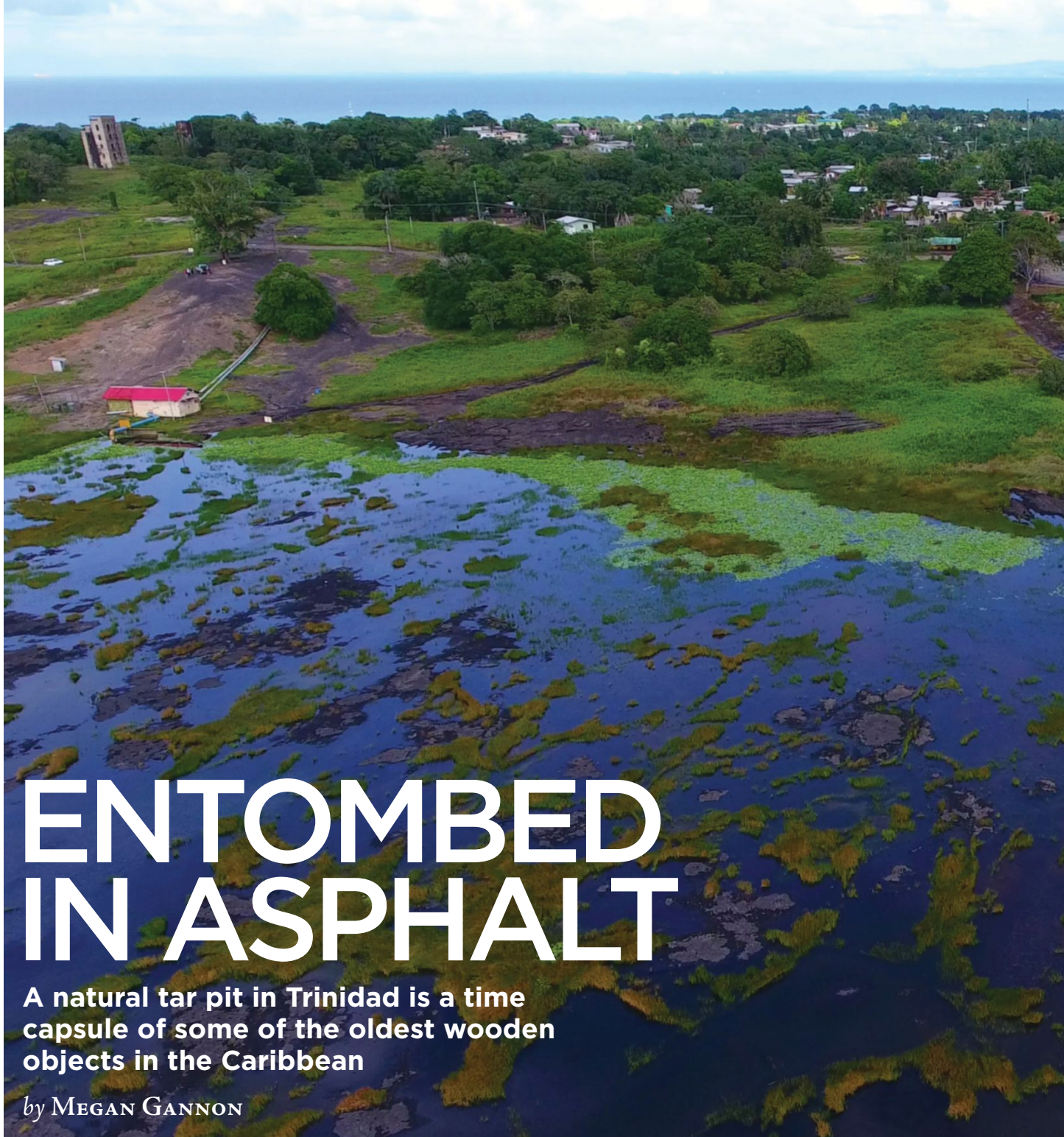
To his surprise, both groups managed to craft rudimentary hand axes. Once they had mastered the basics, Putt had them make the tools while wearing fNIRS sensors. Putt was looking for differences between the two groups. Her theory was that if language centers in the brain lit up regardless of whether participants learned with the sound on or off, it would be a strong clue that tool use and language were somehow related.

Instead, scans of dozens of participants showed that the brain activity of those who learned without hearing the instructions—without language, in other words—looked different. In the toolmakers who learned just by watching Woods, the brain's language centers were quiet; in the scans of people who learned while listening, language centers lit up. What both did have in common was activity in areas that connect with working memory and the areas that process sounds and images. The results were counterintuitive. Learning to use and make Acheulean tools was not closely linked to language centers, as evolutionary anthropologists had assumed. "We've showed you can make a hand ax without language," Putt says.

Rather, Putt's scans suggest that in the absence of verbal instruction and language, the brain relies on a combination of working memory and motor control to make tools. Research has shown it's the same network of neurons we use to make music. "Piano playing uses almost the identical network as toolmaking," Putt says. "You're coordinating your hands while keeping in mind all of these sub-goals."

It's an exciting result. Experiments on modern humans may never conclusively prove how our distant ancestors thought. But the insights archaeologists and neuroscientists are generating together are contributing to our understanding of what makes us human. And with neuroimaging techniques developing fast, their potential to answer questions about our deep past has barely been tapped. "The big picture is to look at other points in time. Were Neanderthals as smart as humans? We can test that, by comparing their tools to the Upper Paleolithic tools humans were making," Putt says. "We're focusing on one small snapshot, but humans have been evolving for millions of years." ■





ENTOMBED IN ASPHALT

A natural tar pit in Trinidad is a time capsule of some of the oldest wooden objects in the Caribbean

by MEGAN GANNON

IN A MARSHY CLEARING on the island of Trinidad, Pitch Lake could be mistaken for a derelict parking lot. But this vaguely industrial landscape is nowhere you'd want to leave your car. Stand in the wrong spot for too long and the ground will begin to sink beneath your feet. The wrinkled surface conceals 10 million tons of slowly churning natural asphalt, 250 feet deep, spreading across 115 acres.

One of the world's biggest natural tar pits, Pitch Lake has always loomed large in the lives of Trinidadians. To the

Arawak people who lived here before the arrival of the Spanish, it was the site of a mythical punishment. They believed that after hunters from another tribe upset the Good Spirit by killing hummingbirds, considered to be the incarnations of ancestors, the hunters' village sank into the earth and created the lake. That myth may have some basis in reality. The lake's tar preserves wood, and over the last century, intact canoe paddles, bowls, weaving tools, seats, and other wooden artifacts from Trinidad's indigenous past have emerged from the pit. Eleven such artifacts are known from Pitch Lake, a remarkable



Trinidad's Pitch Lake is one of the biggest tar pits in the world. Over the years, prehistoric wooden artifacts, such as three canoe paddles (left), have emerged from its depths.

number considering that only seven other ancient wooden objects have been recovered in the entire Lesser Antilles, the island chain that stretches from the Virgin Islands in the north to Trinidad in the south. "Wood and plant remains rarely survive in the archaeological record," says University of Oxford archaeologist Joanna Ostapkowicz. "Yet they were potentially 90 percent of indigenous material culture in Trinidad."

The island has a long history of occupation. Connected to what is now Venezuela by a land bridge until the end of the last Ice Age, Trinidad was probably first visited by nomadic hunter-gatherers as early as 10,000 years ago. When it was first truly populated during the Archaic period (6000–300 B.C.), it became a stepping-stone into the Caribbean for several waves of migration from the South American mainland. The first Amerindian settlers, known



A late 19th-century postcard depicts villagers digging tar that overflowed the banks of Pitch Lake.

to archaeologists as the Ortoiroid culture, migrated from the Orinoco Basin in Venezuela and Colombia. Some of these early inhabitants lived close to Pitch Lake, at a small settlement called Banwari Trace, the oldest archaeological site in the West Indies at 7,200 years old. There, the Ortoiroid people survived by fishing, foraging, hunting, and experimenting with plant cultivation. They left behind bone projectile points, shells, fishing hooks carved from peccary teeth, and an array of stone tools used for scraping animal hides, processing plant fibers to make baskets, and other tasks.

The Ortoiroid people made the bulk of their shelters, weapons, containers, and tools out of organic material, but those objects rotted and disappeared once they were thrown out or buried, leaving little for archaeologists to pore over today. “What we have is a very skewed idea of the total material culture of the Amerindians,” says Leiden University archaeologist Arie Boomert, an authority on Trinidad’s prehistory. “We only know a little bit of what they had and what they did.” And most of that knowledge comes from indirect evidence. For instance, impressions of woven mats left on ceramic griddles allow archaeologists to reconstruct wickerwork, Boomert says.

Pitch Lake has acted as a rare time capsule for these organic objects, but the constant movement of the lake has removed them from their archaeological context. The age and origins of the 11 Pitch Lake artifacts was therefore unknown. However, Ostapkowicz recently embarked on the first scientific study of this dispersed collection, using a battery of tests to help understand which cultures made them and exactly how they fit in Trinidad’s prehistory. In the process, she and her colleagues have made a number of discoveries, some of which have helped show that early Trinidadians were more sophisticated than previously believed.

HISTORIC ACCOUNTS INDICATE that Pitch Lake used to be a more alluring place than it is now, its shores lush with mango, horseradish, turpentine, and pineapple trees. Islands of vegetation within the pitch itself were alive

with caimans, butterflies, and parakeets. “It would have been quite different from what you see today,” Ostapkowicz says. “There would be a very strong smell of sulfur and other chemicals in the air.” Sir Walter Raleigh was one of the first Europeans to see the site, in 1595. He used asphalt from Pitch Lake to caulk the hull of his ship and was impressed by its abundance and “most excellent” quality. Commercial exploitation of the pitch began on a large scale in 1857, when a French firm started refining the asphalt and exporting it around the world. An estimated 11 million tons of tar have since been dredged from the pit. Though the site is naturally refilled by an underground reservoir of oil and gas, the surface has dropped as much as 40 feet in the industrial era.

During this dredging, several strange discoveries were made. In 1951, the director of an asphalt company working at Pitch Lake notified Caribbean archaeologist Irving Rouse that his workers had discovered a six-foot-long wooden paddle, “which must have been handled by a giant.” They also found a four-legged bench with animal heads carved at each end. Both objects were donated to the Peabody Museum of Natural History at Yale University. An unknown number of wooden artifacts might have been unwittingly tossed out or sold to tourists or private collectors over the years of commercial exploitation. The full list of Pitch Lake carvings now in public museums includes three paddles, a bowl, a platter, a mortar, a bench, a high-backed chair known as a *duho*, and two loom weaving tools. Five of those objects are housed in the National Museum and Art Gallery of Trinidad and Tobago—and they are precious resources for Trinidad’s prehistory. “The only other wooden item that we have is a canoe,” says curator Lorraine Johnson.

Among the objects that have been discovered in Pitch Lake are a high-backed bench known as a *duho* (below) and a four-legged bench (bottom) with animal heads carved at each end.



Most of the known wooden artifacts from elsewhere in the Caribbean had been pulled out of caves by nineteenth-century guano harvesters or found at a few waterlogged archaeological sites. These artifacts, such as snuff tubes, reliquaries, and ceremonial seats, were linked to shamans or other high-status people who may have left the objects as offerings in caves and lakes, which were considered entry points to the underworld. “They were preserved because they were visually striking, incredibly elaborate artifacts,” Ostapkowicz says. In contrast, most of the artifacts from Pitch Lake are utilitarian. “Domestic items are far rarer,” she adds. “That’s why Pitch Lake is so special.”

Ostapkowicz enlisted a crew of specialists to determine the age, geographic origin, and wood type of the artifacts. Cranfield University biochemist Fiona Brock developed a procedure to remove and decontaminate small samples of the artifacts for radiocarbon dating. Asphalt has its own (usually extremely old) age, so any leftover pitch clinging to the wood could have resulted in an artificially early date for the artifacts. Brock adapted pitch-removing protocols used by scientists at the famous La Brea Tar Pits in southern California and the team soon had radiocarbon dates for each of the objects.

Boomert had previously believed that most of the Pitch Lake artifacts were made at the site of Palo Seco, near the shores of the lake. This settlement belonged to the Saladoid culture, which flourished in the Caribbean between 300 B.C. and A.D. 800 and was defined by extensive trade networks and finely decorated pottery. Ostapkowicz’s team found that most of the Pitch Lake carvings were indeed made during the Saladoid period. But the radiocarbon dates yielded some surprises. For example, while the two weaving tools look quite similar and were both discovered in the northern part of the lake in 1965, within just two months of each other, the radiocarbon dates showed that the tools were crafted centuries apart. One was made between A.D. 600 and 700, during the Saladoid period; the other was made as early as 3340 B.C. by the Archaic Ortoiroid people. The latter is the oldest wood carving that has ever been directly dated in the Caribbean. “It’s quite amazing that they have material from 3000 B.C. all the way up to the end of the Saladoid period,” says Lisabeth Carlson, an expert on Caribbean prehistoric archaeology with SEARCH, a private archaeological consulting company. While the isotope tests suggested most of the objects were made locally, this weaving tool, or at least the wood used to carve it, came from the South American mainland, in northern Guyana, almost 200 miles away.

Previously, archaeologists believed weaving didn’t start in Trinidad until the Saladoid period. There was simply no evidence of the practice until ceramic spindle whorls started showing up in the archaeological record. But Ostapkowicz thinks the people who were migrating into Trinidad from South America during the Archaic period certainly had some knowledge of making textiles and other woven objects. “To survive in the tropics, you need hammocks and nets, and these

Dating of two weaving tools from Pitch Lake showed one (far left) was made in the sixth century A.D. and the other (left) in the fourth millennium B.C., much earlier than the technology was thought to have been practiced in Trinidad.

are primarily fiber-based technologies.” She says the finding at Pitch Lake, bolstered by other recent discoveries, is contributing to a newly emerging picture of more complex early societies in the Caribbean. A 2015 study of grain residues on Archaic pestles in Trinidad showed that as early as 5000 B.C., people were eating a variety of cultivated plants, including toxic tubers that require a lengthy processing period to be safe to consume. “Often, the perception of the Caribbean, and indeed most of the Americas, is that the more distant the past, the more simple and basic the lifeways,” Ostapkowicz says. “Yet new research is beginning to change that view.”

There still, however, is one lingering mystery about Pitch Lake: Why were the wooden objects deposited there in the first place? Decades ago, Boomert proposed that perhaps a landslide spilled the contents of nearby houses into the tar. Such an event might explain the Amerindian myths about how Pitch Lake formed. The wide range of new radiocarbon dates suggests the objects entered the lake, whether by accident, disaster, or ceremony, over a long span of time. Boomert argues that larger, more artistic objects like the paddles and benches may have been deposited with intention, just as the votive offerings from elsewhere in the Caribbean that were placed in caves and lakes. “Nobody goes walking there with a wooden bench in the form of a jaguar and then says, ‘Oh, there it goes,’” he says. “That must have been a deliberate action.” A human skull dredged from Pitch Lake raised the intriguing possibility that the tar pit was used for burials. But Ostapkowicz’s team found that the skull, about 2,200 years old, doesn’t overlap with the age of any of the wooden artifacts, which therefore can’t be confirmed as burial offerings.

The new dates do offer solid proof for the antiquity of the Pitch Lake artifacts, dispelling the idea that they were made in historic times. In addition, they offer a glimpse of the impressive woodworking abilities of ancient Trinidadians. Ostapkowicz recently collaborated with local artists from the Santa Rosa First People’s community to carve replicas of some Pitch Lake finds so that visitors to the National Museum of Trinidad and Tobago can feel what it would have been like to hold one of the wooden paddles or bowls. Johnson says the museum is now able to supply its displays with the ages of their Pitch Lake objects, enriching one aspect of a site that many Trinidadians might take for granted. “Pitch Lake is not a one-dimensional thing,” Johnson says. “It’s part of our history, it’s part of our commerce, it influences the lives of the people living around it—it’s a living thing. Even to this day, it still brings our history to the surface.” ■

Megan Gannon is a journalist based in Berlin, Germany.



THE VIKING GREAT ARMY

A tale of conflict and adaptation played out in northern England

by DANIEL WEISS

AT FIRST GLANCE, the historic county of Yorkshire in northern England seems as English as can be. It gives its name to Yorkshire pudding, a staple of English cuisine dating back to the eighteenth century. Earlier still, it was home to the royal House of York, whose line included King Richard III. But a closer look reveals a more complicated history. Take Ormesby: Today a suburb of Middlesbrough, its name derives from the Old Norse for “Ormr’s farm.” Or the many streets in the city of York that end in “gate,” from the Old Norse *gata*, meaning “road” or “way.” Even the city’s name comes from the Old Norse Jorvik.

The source of these Scandinavian-influenced place names and the many more that can be found to this day in northern England dates back more than a thousand years. Starting in the late ninth century, tens of thousands of Vikings arrived in Anglo-Saxon England, first as part of an invading force known as the Viking Great Army, and later as part of a massive wave of settlers. Examining the landscape, history, and archaeology of the region tells us much about what happens when cultures clash but ultimately come to coexist. And it helps explain Anglo-Saxon and Viking interactions.

The Viking Great Army’s arrival in 865 was recounted in the *Anglo-Saxon Chronicle*: “A great heathen force came into English land, and they took winter-quarters in East Anglia; there they were horsed, and they made peace.” According to the *Chronicle*, the Vikings spent years campaigning through the territory of the four Anglo-Saxon kingdoms—East Anglia, Mercia, Northumbria, and Wessex. They proved to

be masters at keeping the Anglo-Saxons off balance, making peace with a kingdom one year, only to strike a mortal blow the next. By 880, all the kingdoms had fallen to the Vikings except Wessex, with which they made peace. “The Vikings were very quick and they got quite far inland on their boats,” says Jane Kershaw of the University of Oxford. “They had an element of surprise that the Anglo-Saxons weren’t quite able to anticipate and respond to.”

Viking raiders had been targeting wealthy enclaves on England’s coasts with summertime hit-and-run raids since at least 793, when they launched the infamous, terrifying attack on a monastery on the Holy Island of Lindisfarne off the Northumbrian coast of northeast England. Attacks on other monasteries and settlements on England’s east and west coasts followed. Beginning in 850, Viking forces at times spent the winter at coastal sites, allowing them to start their raids earlier in the year. With the arrival of the Viking Great Army, at last, they were able to penetrate deep into England, making their way along rivers and ancient Roman roads, setting up overwintering camps, and wreaking havoc on the Anglo-Saxons. “It seems that the Vikings are after something a little bit different at this stage,” says Kershaw. “They’re still after portable wealth, but they start to have an eye toward acquiring land as well. They start to see England as somewhere they might be able to settle and reestablish themselves as lords with their own families.”

Tens of thousands of Vikings flowed into northern England beginning in the late 9th century, first as an invading army and then as a wave of migrants. A 10th-century illustration (opposite) depicts a Viking force disembarking in England.



The site near Torksey (left) where the Viking Great Army spent the winter of 872–873 is surveyed by a member of the archaeological team. The camp covered parts of six present-day agricultural fields.

it was unclear whether the camp extended beyond this fortified area, some experts took these findings to suggest that the Great Army was not actually so great after all, numbering at most in the hundreds—and that the *Chronicle*'s authors had exaggerated its size to make it appear more fearsome.

Now, however, an archaeological project at another location, Torksey, in Lincolnshire, where the army camped from 872 to 873, has established that it was indeed very large—it was in fact far more than a mere army. According to Hadley, codirector of the Torksey research project along with Julian Richards of the University of York, “We are getting the sense that the force that was at Torksey and that is referred to as an army in the *Chronicle* actually comprised not just warriors, but people engaged in trade and manufacture, and women and children as well.”

Evidence of the camp at Torksey has been unearthed, for the most part, by avocational metal detectorists. Long active in the United Kingdom, they are strongly encouraged to notify scholars of their finds. When Hadley and Richards learned that a group of detectorists in the Torksey area had discovered ingots, weights, and a concentration of ninth-century coins, including a number of Arabic silver dirhams, all of which appeared to be associated with the Viking Great Army camp, they set out to carefully document the evidence. “We got the detectorists to record their finds more systematically,” says Richards. “We gave them portable global positioning devices to log the coordinates of each discovery so we could plot maps of where everything was coming from.”

The dimensions of the camp that emerged from mapping these finds covered a vast expanse—some 136 acres stretching over six present-day agricultural fields near the east bank of the River Trent north of the modern village of Torksey. “The scale of activity over all those fields suggests a large force, measuring at least in the thousands, with quite a degree of organization,”

THE *ANGLO-SAXON CHRONICLE* describes the Viking Great Army's exploits in outsized terms. In a single day's battle against Wessex, for example, it reports a death toll in the thousands. “The implication is that it's larger than any previous army seen in England,” says Dawn Hadley of the University of Sheffield. But until recently, there had been little archaeological evidence of its presence. Only one overwintering camp mentioned in the *Chronicle* had ever been discovered, at Repton, the capital of Mercia, in present-day Derbyshire, where the army spent the winter of 873–874. Excavations conducted there between 1974 and 1993 by Martin Biddle and his late wife, Birthe Kjølbye-Biddle, had revealed a small, heavily defended enclosure covering just an acre or two. Although



Metal gaming pieces such as this one (top, far right) suggest how Viking army members spent leisure time at Torksey. Evidence of tremendous wealth has also been uncovered at the site, including (clockwise from above right) pieces of hackgold, hacksilver, a gold Carolingian coin, and a silver Arabic dirham.

says Richards. The site is generally dry today as a result of nineteenth-century drainage projects, but the researchers determined that in the ninth century it was a natural island bordered by the River Trent on the west and marshland on the other three sides, which helps explain why the Vikings camped there.

By the time the Viking Great Army overwintered at Torksey, it had been in England for seven years and had already conquered both East Anglia and Northumbria. Archaeologists knew that it could be expected to have accumulated a great deal of treasure, and, in fact, more than 120 Arabic silver dirhams have been unearthed. As is characteristic of the Vikings, the coins had been cut up into pieces to be traded for the value of their metal. These coins are a strong sign of the presence of Vikings, who are known to have traded slaves for them in Eastern Europe. They are only rarely found in typical Anglo-Saxon contexts. “Torksey has the largest concentration of dirhams from any site in Britain or Ireland,” says Hadley. “So that jumps out.” In addition, at least 60 pieces of hacksilver, which was chopped up for use in trade, along with a dozen pieces of rare hackgold, have been found. “If they lost that much material,” asks Richards, “how much silver and gold must there have been in circulation?”

The Vikings at the camp, according to Hadley and Richards, may well have engaged in trade of a sort with local Anglo-Saxons. Scandinavians at the time generally used raw metal for trade rather than coins. Several hundred weights of the kind they are known to have used to facilitate exchange have been found. However, although the Vikings had negotiated a peace with the Mercians before setting up camp, it is unclear, according to Kershaw, how cordial relations would have been with those living nearby. “I don’t see what Viking camps would have had to offer locals,” she says. “I see them as being quite parasitic on the local landscape. They would have had to acquire a lot of provisions to sustain a large army, but I don’t think they would have done that peacefully. There might have been forced, coercive trade, but I don’t think these are places where you would walk up and buy a couple of pots. The trade that was going on was probably more among the army members themselves.”

The camp at Torksey would have been self-sustaining in some respects. “It’s almost like a town on the move,” says Hadley. Life within its confines is becoming clearer for researchers. Members of the army appear to have had leisure time on their hands, as shown by the number of lead gaming pieces that have been found at the site. The presence of metalworkers is indicated by collections of scrap copper and iron, apparently gathered to be melted down. Women seem to have been part of the camp as well, as suggested by the discovery of spindle whorls and other tools used to work textiles. It is unclear, though, whether these were Scandinavian women who had come along with the army as part of families, or captives taken as spoils of war. Added to all this are hints of an aspiring kingdom attempting to establish itself. Three iron plowshares discovered together may have been headed for the scrap heap.



Several hundred weights found at the Torksey site would have been used by the Viking army during the course of trade, either among themselves or with those living nearby.

But, according to Richards, “The more interesting possibility is that they were already thinking about seizing agricultural estates and acquired the plowshares with that aim in mind.”

THE PEACE THE VIKINGS had made with the Mercians in Torksey was soon broken. The next year, 873, according to the *Anglo-Saxon Chronicle*, the Vikings charged into the kingdom’s capital, Repton, some 60 miles southwest along the Trent. There, they sacked a monastery, sent the king, Burghred, fleeing to Paris, and replaced him with a figurehead named Ceolwulf. This sort of bait and switch was typical of how the Vikings managed to get the better of the Anglo-Saxons. “The Anglo-Saxons did their standard thing of making an oath, exchanging hostages, and paying the Vikings some money, and then they expected the Vikings to go away,” says Kershaw. “But the Vikings don’t play by the same rules. They take the money,



A Viking warrior unearthed at the site in Repton where the Great Army camped over the winter of 873–874 was found to have received severe injuries to the head and left thigh.

but they come back the next year. They swear an oath, but they don't keep it. The Anglo-Saxons don't quite know how to negotiate with someone who doesn't respect their laws of peacemaking."

The early Biddle excavations at the Repton overwintering camp of 873–874 were able to illustrate how the Vikings behaved in victory. After defeating the Mercians, the Vikings ran roughshod over some of their most sacred territory. They built a heavily fortified D-shaped enclosure with St. Wystan's church to the south serving as a gatehouse and possibly an eating hall. A large defensive ditch was constructed, cutting through Mercian cemeteries to the east and west before turning north to meet the River Trent. Archaeologists also discovered what are believed to have been at least 10 carved Anglo-Saxon stone crosses smashed into small pieces. Says Biddle, who is now an emeritus professor at the University of Oxford, "They broke the place up."



The recent discovery of an arrow-head (above) and ship nail (left) provides further evidence of the Viking army's presence in Repton.

The *Anglo-Saxon Chronicle* offers no insights into the nature of the battle for Repton, but evidence shows it was likely a bloody one. Next to a crypt where members of the Mercian royal family were buried, the excavation unearthed a Viking warrior who had suffered grievous injuries and had been laid to rest alongside an iron sword, with a silver Thor's hammer around his neck. "He died a very violent death indeed," says



In this aerial view of Repton, one can see St. Wystan's church (above right), which the Vikings put to use as a gatehouse at the edge of a fortified enclosure, and part of a recent excavation (center) that established the Viking camp was larger than had been thought.

Biddle, reflecting back on the discovery. “He looks as though someone stabbed him more or less in the eyes. But the real great wound, which we found immediately upon excavation, was a huge cut into the inner side of his left femur. It could only have been made by someone standing above him, perhaps with a heavy sword or an ax.” A boar’s tusk had been placed between the warrior’s thighs, possibly to replace genitalia damaged or severed in his final battle.

Many more Vikings appear to have been buried in a charnel mound outside the fortified enclosure, in what was once an Anglo-Saxon mausoleum. There, Biddle discovered the disarticulated remains of at least 264 people. The remains belonged overwhelmingly to adult males. Found among them were an iron ax, two fighting knives, and five silver pennies dating to 872–874. As part of a new archaeological examination of the site, radiocarbon dating and analysis of the bones have demonstrated that they date to the time when the army overwintered at Repton and that they had been subjected to



Scandinavian-style jewelry discovered in East Anglia, such as a disc brooch (top) and a gilt silver pendant (above), both shown front and back, suggest Viking women migrated to England in the late 9th to early 10th centuries.

extensive violence and trauma. Cat Jarman of the University of Bristol, codirector of the current project at Repton, suggests that many of those whose bones were found in the deposit were Viking warriors killed in battle elsewhere and then buried during the winter. “We don’t actually know what happened to the thousands of people who died in battles that we read about in the *Anglo-Saxon Chronicle*,” she says. “But there are a lot of examples from across the Viking world of people moving bones, so it wouldn’t be surprising if the Viking Great Army took bones from battle sites and put them in this context.”

It also appears that the overwintering camp at Repton

extended beyond the heavily fortified enclosure. Excavations near the charnel mound have turned up Viking weapons—an arrowhead, a fragment of an ax—as well as lead gaming pieces and evidence of metalworking. Several clinker nails typically used in ship construction have also been found. “We know that they moved up and down the rivers, and their ships would have needed frequent repairs,” says Jarman. “They were probably getting ready for the next season’s attack.”

After overwintering at Repton from 873 to 874, the Viking Great Army split in two. One part, under the leadership of Guthrum, headed south and was ultimately defeated in 878 by Wessex and its king, Alfred the Great. To make peace, Guthrum was baptized along with 30 of his warriors, and ended up reigning as an Anglo-Saxon-style king over a swath of territory allocated to him by Alfred. The other part of the army headed north and went on to “share out the land,” as the *Anglo-Saxon Chronicle* puts it, in Northumbria in 876, Mercia in 877, and East Anglia in 880. This seems to suggest that the Vikings took over vast stretches of England, but how did it work exactly? “We don’t really know,” says Kershaw. “The consensus is that they do take over the Anglo-Saxon estates, but I think you probably have Anglo-Saxon communities left in place alongside the new Scandinavian ones.”

THE AREA OF NORTHERN and eastern England inhabited by the Vikings ultimately came to be known as the Danelaw, after the Anglo-Saxons’ belief that most of the invaders had come from Denmark. New evidence suggests that once the army members settled there, large numbers of Viking women came over to join them. Kershaw has analyzed metal-detected finds from rural parts of the Danelaw and identified 125 women’s brooches of types that have turned up nowhere else in England, but have been found in Scandinavia, particularly in Denmark, and date to the Viking Age. “It’s clear that these items are coming in on the clothing of women arriving from southern Scandinavia to settle in rural England,” she says. “So I think there is a second wave of migration following the settlement of the Danelaw that includes women and children.” The discovery of brooches that mix Anglo-Saxon and Scandinavian elements indicates that the two communities intermingled to a great degree. “These styles are seen as somehow fashionable by the locals,” says Kershaw. “There is a desire to emulate these styles, which suggests that Scandinavians are either in political control or they’re seen as exotic.”

The Anglo-Saxons, united under the House of Wessex, regained rule of the Danelaw by the mid-tenth century, but the Scandinavian influence endured. In a 1086 survey of England called the *Domesday Book*, nearly half the place names in Yorkshire are Scandinavian. “It’s not just towns and villages that have these names,” says Kershaw. “It’s really small features of the rural landscape, such as rivers, hedgerows, and little parks.” More than a thousand years after the Vikings first arrived, and despite their eventual defeat, their influence remains etched into the fabric of England to this day. ■

Daniel Weiss is senior editor at *ARCHAEOLOGY*.

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Excavations beneath two family-owned vineyards outside the Hungarian town of Szigetvár are beginning to reveal the remains of Turbek, a 16th-century complex built to honor the Ottoman sultan Suleiman I.

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THE SEARCH FOR THE SULTAN'S TOMB

How archaeologists trying to locate the final resting place of Suleiman the Magnificent uncovered the remains of a crucial outpost of the Ottoman Empire

by SARA TOTH STUB

A red sandstone block props open the door to Gyula Kereszturi's wine cellar in a small village in southern Hungary. Kereszturi, who ekes out a living selling homemade wine and plum brandy in one of this country's poorest regions, found the block more than two decades ago when he expanded the cellar. Over the years, it has made a good doorstep, or sometimes a makeshift table.

But it used to be much more than that. This block was once part

of the revered mausoleum complex of Suleiman the Magnificent, the Ottoman Empire's most prolific builder and accomplished military leader. Although Kereszturi and other locals had long referred to the occasional red bricks they found buried in their yards as "Turkish ruins," they had no idea that anything significant had ever stood there. And, until recently, neither did archaeologists. That all changed when remote sensing and later excavation revealed that the ground under

Kereszturi's house and vineyard might contain the ruins of Turbek, a once-flourishing Muslim pilgrimage destination on the ground where Suleiman died of natural causes in 1566 during the brutal Battle of Szigetvár, a crucial contest in the fight to expand the Ottoman hold on Europe.

"This is the most exciting find from the Ottoman period in Hungary," says Norbert Pap, a geographer at the University of Pécs, who leads the ongoing work of the interdisciplinary team that first identified the ruins,

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whose location had eluded generations of scholars. The discovery of Turbek is significant because it is the only town the Ottomans founded in Hungary during the nearly 150 years they ruled there. “It is a symbol of the Ottoman occupation of Europe, and an expression of *dar-al-Islam*,” explains Pap, using the Arabic term that refers to a region under Muslim rule and where Islamic law prevails. The newly unearthed site, which covers about 10 acres and contains the foundations of a mausoleum, a mosque, a Sufi monastery, and what is likely a military barracks, offers a window into the long-vanished and oft-overlooked cultural, political, and economic life that the Ottomans carved out for themselves more than 600 miles from their capital of Istanbul.

Founded in the Anatolia region of what is now Turkey in 1299, the Ottoman Empire eventually became a global power and remained such until its demise during World War I. The empire reached its height in the sixteenth century under its longest-serving ruler, Sultan Suleiman I, known as Suleiman the Magnificent. During this period, the Ottomans extended their rule to almost all of the Middle East, North Africa, and parts of Europe. This solidified their control over lucrative trade routes, and the new wealth they amassed was reflected in a grand building spree in the capital of Istanbul. But Suleiman was intent on conquering more of Europe, especially the capital of the Habsburg Empire, Vienna. This put Hungary in the Ottomans’ strategic path. Beginning with their victory at the Battle of Mohacs in 1526, the Ottomans began to gradually conquer pieces of Hungary, turning churches into mosques, taking over fortresses, and adding elements such as bathhouses to existing cities. Although the Ottomans gained significant ground, the continuing fight put up by



Fodor, director of the Institute of History at the Hungarian Academy of Sciences in Budapest. The local Hungarian population also never adopted Islamic culture or religion on any large scale. “All social factors in Hungary, from the king at the top to the peasants at the bottom, regarded the conquerors as savages, pagans, and natural enemies, as persecutors of the country and of the Christian faith, and, later, as archenemies,” Fodor says. “The anti-Ottoman struggle was conceived partly as self-defense, and partly as a war that protected the entire Christian world. This explains why, despite long cohabitation and occasional political cooperation, Hungarian and Ottoman Turkish cultures influenced each other only superficially.”



Gyula Kereszturi (above) stands in his yard, where the remains of buildings belonging to the sultan's memorial complex were uncovered. Kereszturi discovered this red sandstone block (top) thought to have come from the complex.

the Hungarians challenged their fragile hold on power.

According to historians, the Ottomans were confined to living a rather isolated existence in the areas they conquered. “They adopted almost nothing from Hungarian culture and instead built a high culture of their own on Hungarian soil,” explains Pal

To protect itself from further Ottoman encroachment, Hungary relied on a series of fortresses. One of these, Szigetvar, dating to the Middle Ages, became especially important, as it stood just west of the Ottoman-occupied Hungarian city of Pecs, and protected the western half of Hungary, parts of Croatia, and the roads leading

to Vienna. Perched on a hilltop surrounded by a stream and marshy land, Szigetvar, which means “island castle,” was able to ward off several Ottoman attacks in the 1550s.

Growing old and more determined to conquer Vienna, Suleiman set out with his troops in the spring of 1566 for a three-month-long march to Szigetvar in another attempt to eventually get to Vienna, where in 1529 his troops had been dramatically defeated. When they arrived in the area, the Turks set up tents on a small hill just north of the fortress. On August 9, they began bombarding it. Just over four weeks later, on September 7, the besieged Hungarian forces, who had run out of gunpowder, food, and water, made a futile attempt to attack the Ottomans.

Many Hungarian soldiers were killed and the castle fell into Ottoman hands, but the Turks had suffered such heavy losses as well that it would be another 130 years before their next attempt to take Vienna.

This was recorded as a heroic moment in Hungarian history. For years, the fight with the Ottomans was seen not just in nationalistic terms, but also as a spiritual battle between Christianity and Islam. Miklos Zrinyi, the great-grandson of the commander of the Hungarian troops at Szigetvar, writes in his 1646 epic poem, *The Peril of Szigetvar*:

We, moreover, must fight not for any trivial reason

*But for our beloved Christian homeland
For our Lord, for our wives, for our children*

For our honor and our lives.

This battle in the hinterlands of central Europe also left a deep and lasting mark on Turkish history. The night before his troops conquered the castle, Suleiman, who had ruled the empire for 46 years, died in his tent from old age, just shy of his 72nd birthday. His body was eventually taken back to Istanbul, where he was interred. But stories later emerged that his heart and other internal organs had been left in Hungary, buried in the ground where his tent had once stood. According to this widespread legend, Suleiman's inner circle kept his death a secret so his troops' morale wouldn't be damaged. His advisers are said to have departed from Islamic tradition by removing and burying his organs and embalming his body to prevent its decay in the late summer heat before it could be transported back to Turkey.

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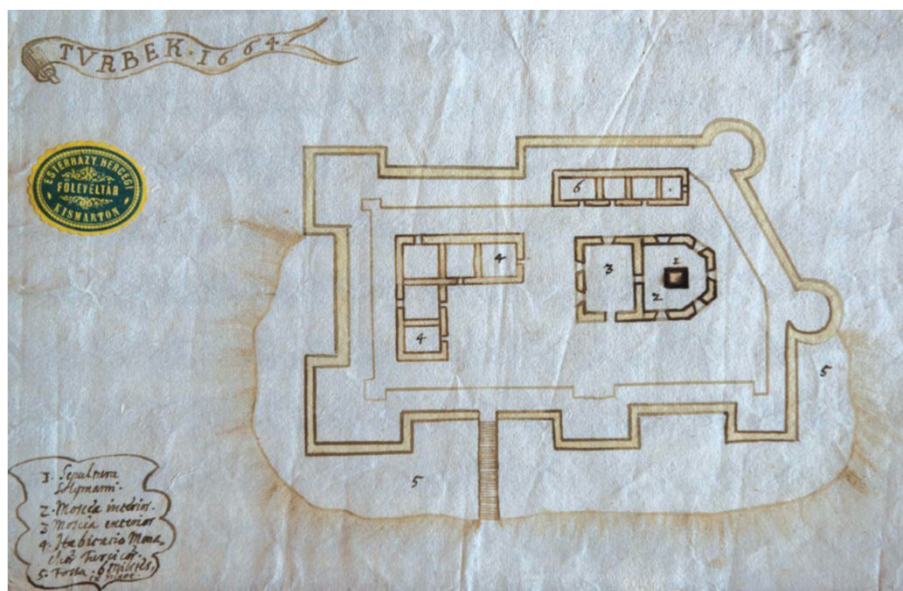
LETTER FROM HUNGARY

Most scholars, however, dismiss the story as folklore.

Regardless of how Suleiman's body was handled, the place where he died emerged as meaningful. His successor, his son Selim II, soon ordered that a tomb be built to honor Suleiman. "The construction of this tomb had great symbolism," says Ali Uzay Peker, professor of architecture at Middle East Technical University in Istanbul, who has also worked at Turbek. "It was at the border between the Ottoman and Habsburg realms in eastern Europe. Hence it aroused spiritual attachment to the land."

A mosque, an Islamic dervish monastery, and a military barracks were built around the tomb, according to a 1664 sketch by Pal Esterhazy, a Hungarian military commander. A caravansary where traders and travelers could leave their horses, shops, a bathhouse, and other buildings were then established around the inner core of the complex to accommodate a growing number of Muslim pilgrims. These pilgrims came mainly from Turkey and elsewhere in the Balkans, according to the descriptions of Evliya Celebi, the famous Turkish traveler who journeyed for 40 years around the lands of the Ottoman Empire, recording his observations in the epic *Seyahatname*, or "Book of Travels."

Historical accounts also indicate that ascetic practices of Sufism developed at Turbek, and that it became an important center of Islamic mysticism in the region. Several influential mystical books were written there, and among the pilgrims were members of other Sufi



A 1664 sketch (above), by the Hungarian military commander and prince Pal Esterhazy shows the layout of Turbek. It helped archaeologists identify the ruins found under the vineyard as Turbek. A 16th-century portrait (below) of Suleiman.



orders. Contemporary documents attest that about 60 Ottoman soldiers, who lived in a barracks adjacent to the mosque, tomb, and monastery, faithfully guarded the area.

Although other mosques and dervish monasteries were built in Hungary, Turbek was unique because it was set up as its own settlement, outside Szigetvar. This breaks with the overall pattern of Ottoman residents simply moving into fortified areas they had conquered, as happened in the cities of Pecs and Buda, on the Danube River. Fodor says, "The shrine and the town around it completely differed from the usual Ottoman centers that emerged in Hungary at that time."

By the late seventeenth century, the Ottomans were slowly losing their grip on power in Hungary as the Habsburgs began to win more battles, eventually

pushing the Turks out of the country. Ottoman life at Turbek came to an end in 1693, when it was taken over by Habsburg forces and almost completely destroyed. Turbek was reduced to a memory, and ultimately a legend—although through the centuries there have been stories of locals digging in search of Suleiman's organs, which they had heard were buried in a golden bowl.

Archaeologists had long wondered where Turbek actually stood, and if there was anything left of it. There have been abundant, yet conflicting, theories about its location. Since 1913, a plaque outside St. Mary's Roman Catholic Church near Szigetvar has declared, in both Hungarian and Turkish, that the building was established on the land where Suleiman's heart was buried. Another local legend claims that his organs were interred on the banks of the Almas Stream. There, in 1994, a symbolic tomb of Suleiman was created as part of the Hungarian-

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Turkish Friendship Park, which was established to mark the sultan's 500th birthday. But archaeological excavations had never revealed any conclusive evidence of Ottoman settlement—much less a mausoleum complex—in these places. “There were lots of arguments but no one could find evidence,” Pap says.

In 2012, he and his team decided to take a different approach to the question. Rather than rely on local tales about where Turbek used to stand, they gathered data from old maps, crop records, and other sources, and used geographic information systems technology to reconstruct the landscape and topography of the area around Szigetvar in the sixteenth and seventeenth centuries. “How much had changed since then was shocking,” Pap says. “And it quickly became clear that Turbek could not have been at the church or the Friendship Park because those areas were way too marshy back then.” Rather, the landscape model indicated that the long-lost settlement likely sat in the middle of what today

is a vineyard, about 2.7 miles northeast of the castle.

According to Pap's reconstruction, this area would have been on a small hilltop, a detail recorded by Suleiman's aides in their descriptions of where tents were placed during the battle. That area also offered a view of the castle, another detail reported by Suleiman's aides—and something not available at the proposed church and Friendship Park locations. When Pap visited and talked to the owners of the vineyard there, they offered him a glass of “Szemlohegy” wine. “I was shocked,” Pap recalls. This is the same name that Suleiman's aides had recorded for the hill where they set up the tents for the Battle of Szigetvar. “The name of this place had survived in the name of the wine.” In 2015, geophysical examinations revealed the foundations of five structures spread out over 10 acres just over a foot below the surface of the vineyard. Furthermore, the layout of the buildings was consistent with the 1664 sketch of Turbek that Esterhazy had made.

The team began excavating in

2016, first uncovering the foundations of a large square building. “We had more and more evidence that this building must be a tomb, because it had no mihrab and no minaret,” says Erika Hancz, an archaeologist at the University of Pecs who oversaw the dig. The team found several small artifacts within the foundation of this square building, including carved stone palmettes, popular as a decoration and seen on many Ottoman structures,



The Roman Catholic St. Mary's Church was, according to one legend, built on the site where Suleiman's heart was buried. But archaeologists have found no evidence of Ottoman buildings or monuments there.



Now the site of a monument to friendship between Turkey and Hungary, this spot near the Almas Stream was also long believed to be a possible location of Turbek.

including Suleiman the Magnificent's burial chamber and mosque in Istanbul. “The building materials and techniques and the objects of daily use confirmed that the site belongs to the Ottoman period in Szigetvar,” Peker says. The fact that the layout matches Esterhazy's drawing, along with the absence of other known Ottoman settlements in the area proves, at long last, that this is, indeed, the mausoleum of Suleiman.

Another building—identified as the dervish monastery—contains many small chambers, and excavation

there uncovered Ottoman coins along with many everyday objects, including parts of a cooking stove, pieces of ceramic and glass vessels, and metal artifacts such as belt buckles. The style of these household items is similar to those found in the Balkan countries south of Hungary, Peker says. These objects, along with historical evidence, indicate that the inhabitants of Turbek were mainly Muslims who moved here from the Balkans. But, explains Hancz, the pieces of brightly colored ceramics typical of the southern Anatolian region of Turkey and a fragment of porcelain from China speak to the site's global connections. Horsemen's shoes and spurs, along with a millstone and remains of



Pieces of decorative building materials, such as this one found at Turbek, echo the style of that seen in Istanbul and other areas of the Ottoman Empire.

grains offer evidence that the residents of Turbek grew crops.

The fact that all that is left of Turbek are building foundations no more than 15 inches tall is consistent

with eyewitness accounts of Habsburg soldiers when they drove the Ottomans from Turkey. "The Habsburgs did their best to destroy the site to the bones," Peker says. This degree of destruction reveals how important the place had become in Ottoman culture and politics—and how much the Habsburgs

wanted to erase that. "It's clear that they aimed to wipe out all traces of the Ottomans," Peker says. "This can give us a sense of the significance attached to the tomb when it stood here: It was a visible sign of the Ottoman presence on the border and it was a reminder of land claims."

The team's next step is to excavate the foundations of the building they believe is the military barracks, and to then look further afield for the baths, caravansary, and other surrounding structures mentioned by the traveler Celebi. "We don't know everything, clearly, but we have enough evidence to imagine the site, and hope to find the other buildings," Hancz says. "We still have a lot to do." ■

Sara Toth Stub is a journalist living in Jerusalem.

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Meeting attendees at the opening night reception



John Papadopoulos delivers the Annual Meeting's public lecture.



Society members at the members' forum



Participants in AIA's Fourth Annual Conference for Heritage Educators

Attendees at the 119th AIA-SCS Joint Annual Meeting in Boston added several new words to their vocabulary, including “bombogenesis,” “snowpocalypse,” and “snow cyclone,” as they encountered the massive snowstorm that blanketed most of the Northeastern part of the United States. The first major storm of 2018—almost a foot of snow accompanied by hurricane-strength winds, severe coastal flooding, and bitter cold—hit Boston on January 4, the opening day of the Annual Meeting. Despite the adverse conditions, more than 1,900

archaeologists, classicists, and philologists arrived in Boston for four days of academic paper presentations, workshops, roundtable discussions, receptions, and special events.

The Annual Meeting's tone was set at the program's first public event, an engaging and entertaining lecture presented by John K. Papadopoulos of the UCLA Cotsen Institute of Archaeology, “The Ancient Methone Archaeological Project: 2014–2017.” Papadopoulos described how ancient Methone's strategic location on the Thermaic Gulf attracted traders, prospectors, colonists, and conquerors from various parts of the Greek world and the broader Mediterranean. Philip II of Macedon conquered the site in 354 B.C. in a siege that famously cost him an eye.

The Annual Meeting featured 88 academic sessions and several special events, including the Annual Conference for Heritage Educators and a Society members'

forum. The Conference for Heritage Educators was the fourth in a series of events designed to create a collaborative network, discuss issues and challenges, and initiate common projects. At previous meetings, participants drafted a statement of ethics, encouraged more publications, called for more program evaluations and assessments, and discussed the creation of stand-alone heritage education organizations.

This year, the conference featured a panel discussion with representatives from a variety of organizations including state and federal agencies, museums and historical societies, and avocational associations. Sessions covered such topics as training the trainers, writing grant proposals, writing for the public, and program evaluation and assessment. The proceedings of the conference will be made available on the AIA website.

The Society members' “Forum on Looted Art, Archaeology, and Restitution: The Napoleon and Al Mahdi Cases,” was part of a series of programs designed to give AIA Local Society members the opportunity to participate in meaningful conversations about archaeological issues. Each forum's topic is chosen by a task group within the AIA Societies Committee. The task group researches the topic and prepares a study guide with background information and lists of resources and forum questions. The study guides are distributed to Society officers who can lead discussions with their members. The goals of the forum are to provide Societies and their members with an opportunity to share their opinions with the national office and the rest of the AIA membership. It is also an opportunity for a Society to organize an engaging and interactive event to attract new and diverse audiences.



AIA PRESENTS ANNUAL AWARDS AT AM



Aia award winners (from left), Ian Hodder, A. Mark Pollard, James Packer, Eric Poehler, AIA President Jodi Magness, Chelsea Gardner, Robert Kelly, and Laure Marest-Caffey

Gold Medal for Distinguished Archaeological Achievement to Ian Hodder, Dunlevie Family Professor at Stanford University. Hodder has been one of the most influential archaeological thinkers since the early 1980s, when his critique of the processual approach spawned the post-processual movement that has since driven much of archaeological thought. His influential publications and socially engaged, postmodern archaeology set the field's intellectual agenda throughout the final two decades of the twentieth century and has continued into the first part of the twenty-first.

Pomerance Award for Scientific Contributions to Archaeology to A. Mark Pollard, Edward Hall Professor of Archaeological Science in the Research Laboratory for Archaeology and the History of Art at the University of Oxford. Pollard has been a leading figure in promoting the field of archaeological science and in challenging scholars to consider the intellectual place of archaeological science and its practice within archaeology.

Martha and Artemis Joukowsky Distinguished Service Award to Robert Littman, Professor and Chair of Classics at the University

of Hawaii at Manoa. Littman is the main force behind the vibrant and active AIA Local Society on Oahu and has been the voice of archaeology and the AIA in Hawaii for 40 years. He has been instrumental in bringing the world of Mediterranean archaeology to the island and in making the AIA a thriving part of its community.

Outstanding Public Service Award to Bonnie Magness-Gardiner, who has promoted cultural heritage preservation in her many years of service to the U.S. government in different capacities, including as the first program manager of the FBI's Art Theft Program and as a senior cultural property analyst in the Cultural Heritage Center of the Department of State's Bureau of Educational and Cultural Affairs. She also assisted the U.S. Department of State's recovery and reconstruction efforts in the aftermath of the looting of the Iraq National Museum.

Excellence in Undergraduate Teaching Award to David Soren, Regents Professor of Classics and Anthropology at the University of Arizona. Soren has garnered almost every possible teaching award at Arizona and has drawn majors by the dozens into classics and



DISPATCHES

FROM THE AIA

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anthropology. He founded the year-round Orvieto Study Abroad Program and has worked to expand the curriculum there to include art, art history, English, history, Italian, music, journalism, psychology, and communications.

James R. Wiseman Book Award to *The Roman Forum: A Reconstruction and Architectural Guide*, by Gilbert J. Gorski and James E. Packer (Cambridge University Press, 2015). The publication successfully combines a coffee table book format with a scholarly encyclopedia, the result of the collaboration between Gorski, an architect, and Packer, a professor of classics. The book will serve as a reference work for all students of Roman architecture and topography.

Felicia A. Holton Book Award for a major work of nonfiction written for the general public to Robert L. Kelly for his book *The Fifth Beginning: What Six Million Years of Human History Can Tell Us About Our Future* (University of California Press, 2016). Kelly examines four key developments, or “beginnings,” in the six-million-year history of humanity—the emergence of technology, culture, agriculture, and the state—and in the final chapter speculates on what may lie in store for humanity in a “fifth beginning.”

Award for Outstanding Work in Digital Archaeology to the Pompeii Bibliography and Mapping Project, an open online resource that integrates over two centuries of scholarship with innovative digital tools to create a unique research tool for those studying the site of Pompeii.

Graduate Student Paper Award to Chelsea Gardner, University of British Columbia and Crake Fellow at Mount Allison University, for her paper “Money, Marbles, and Chalk: The Ancient Quarries of the Mani Peninsula.”

Runner-up for **Graduate Student Paper Award** to Laure Marest-Caffey, University of California, Berkeley, for her paper “Reconstructing Networks from the Archive of Seleukia on the Tigris: Ruler Portraits on Hellenistic Seals.” Both papers were delivered at the 118th Joint AIA-SCS Annual Meeting held in Toronto, January 5–8, 2017.

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We encourage you to join the AIA. Your membership dues support archaeological excavations and research around the world. To become a member, go to archaeological.org/join. ARCHAEOLOGY magazine subscribers can upgrade their membership—which will include membership in the AIA Local Society closest to you—for just \$40. To upgrade, go to archaeological.org/upgrade.

AIA LECTURE PROGRAM BEGINS SECOND HALF OF THE SEASON

The second half of the 122nd year of the AIA Lecture Program began in January. The schedule for the 2017–2018 Lecture Program is online at archaeological.org/lectures. Lectures run from early September to the end of April. As always, all lectures are free and open to the public. Be sure to spread the word to interested friends and family.

AIA SPRING GRANTS

If you are an undergraduate or graduate archaeology student trying to get on your first field project, we encourage you to apply for the Jane C. Waldbaum Archaeological Field School Scholarship. The \$1,000 grant can assist you with the expenses associated with attending a field school. Applications are due by March 1, 2018.

For those of you pursuing a career in museum studies, the Elizabeth Bartman Museum Internship Program is accepting applications. The program assists graduate students or those who have recently completed a master's degree with the expenses associated with participating in a museum internship either in the U.S. or abroad. The deadline is April 1, 2018.

ATTENTION GRANT AND FELLOWSHIP SEEKERS

The AIA has revised the requirements for people applying for its grants. Unless stated otherwise, to qualify for a grant, an applicant must have been a member of the AIA in good standing for two consecutive years (one year for students) at the application deadline. Please review the application requirements for AIA funding at archaeological.org/grants.





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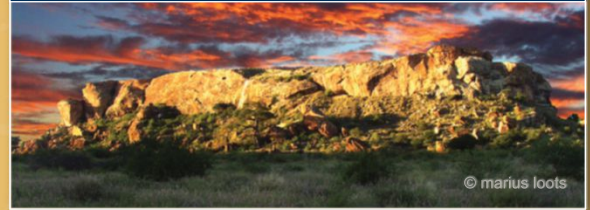
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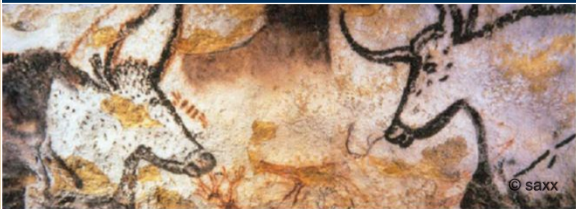
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with paleoanthropologist Ian Tattersall

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September 19 - October 1, 2018 (13 days)
with prehistorian Paul Bahn

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October 3 - 14, 2018 (12 days)
with archaeologist C. Brian Rose

GEORGIA & ARMENIA: BEYOND THE GOLDEN FLEECE

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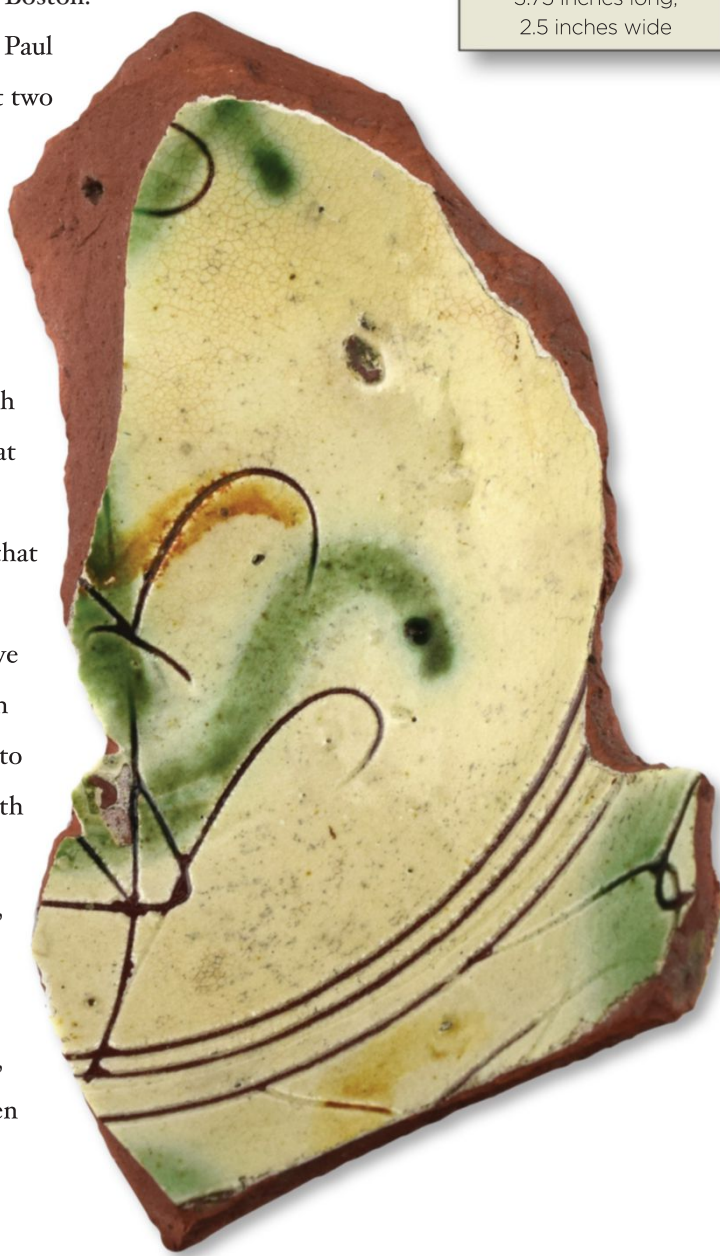


October 12 - 26, 2018 (15 days)
with archaeologist Jo Burkholder

Boston city archaeologist Joe Bagley says that when he first saw the sherd, he honestly had no idea what it was. Although it is one of the largest pottery fragments uncovered during excavations at the Pierce-Hichborn House in Boston's North End, and its decoration is well preserved, neither he nor anyone on his team had seen anything like it in any similar context. "The combination of red ceramic with white and green decoration is almost unheard of from New England sites, so we knew it was something different." It turned out to be one of the oldest—and surely one of the most expensive—European ceramics ever found in Boston.

The Pierce-Hichborn House, which is adjacent to the Paul Revere House, dates to about 1711, but there were at least two earlier residences on the site. The first likely belonged to the carpenter Bartholomew Bernard, who lived there between 1645 and 1656, and a later one, that of the mariner John Jeffs, a resident from 1656 to 1676. But it's possible, says Bagley, that the plate was deposited even earlier by an unknown owner, and that it is associated with one of Boston's first European settlers. "We are seeing that downtown Boston in the early seventeenth century was a wealthy port with wealthy individuals," says Bagley, "and that despite Puritan rules and regulations against conspicuous wealth, in private homes people showed off their expensive and highly decorated goods." While during the eighteenth century, the ceramic trade was limited almost exclusively to English, Dutch, and Chinese goods, during the seventeenth century, many products—especially ceramics—came to Boston from across Europe, including Germany, Portugal, the Netherlands, England, France, Spain, and Italy. Says Bagley, "Despite the overall dark and dreary impressions we get from Puritan stories and popular history, ceramics, glass, and other goods found in Puritans' homes were often very bright, colorful, and fancy."

WHAT IS IT
Sgraffito slip-decorated plate
CULTURE
North Italian
DATE
ca. 1630
MATERIAL
Ceramic
FOUND
Boston, Massachusetts
DIMENSIONS
3.75 inches long, 2.5 inches wide



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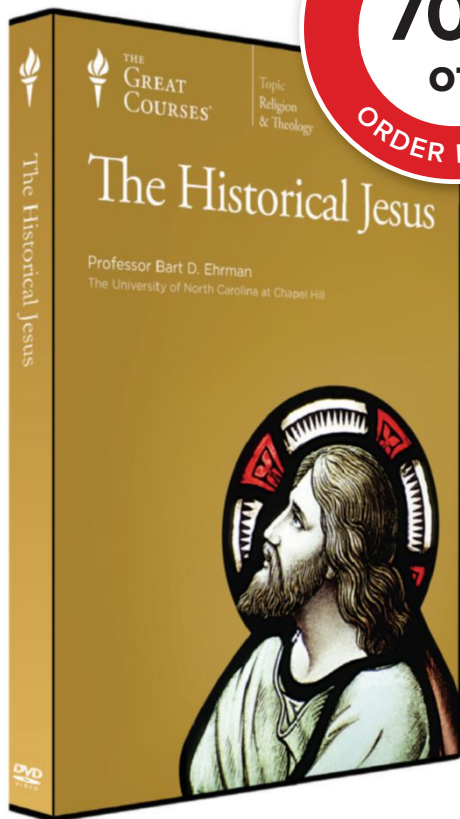
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